Designing future productive landscapes

in the Mackenzie Basin

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The Mackenzie Basin, in the South Island of New Zealand, exhibits landscape social and biophysical conflicts and pressure typical of multi-use landscapes throughout New Zealand and worldwide. In response to these landscape conflicts, the community defined a vision for the Mackenzie Basin through the Mackenzie Agreement. This research uses Design Directed Research to investigate the potential for 'human scale' concepts to assist Mackenzie Basin stakeholders in achieving this vision. Three 'values' were identified in the Mackenzie Basin. The first was the dissonance between the picturesque precedents of New Zealand reserve areas, and the Mackenzie landscape. The second was the additional conflicts introduced through technology advancements enabling pivot irrigation in the Mackenzie Basin, and the resulting landscape change. The third value was the relationship between these landscape qualities and the community identity of the region. The question asked in this research was: Is it possible to develop a structured mix of compelling multifunctional landscape visions for the Mackenzie Basin? Through the research, two supporting questions were identified and investigated: What is the potential for levels and layers of conservation and production values through all landscapes? and; What are the opportunities afforded by removing the landscape condition as the deciding factor for an action?

In response to the existing production bias in the Mackenzie Basin, all concepts were generated to include a restoration type, through use of a matrix. These concepts were then applied to different landscape conditions as a means to identify ways to reduce the perceptions surrounding ecologically valuable (therefore unproductive) or totally degraded (therefore of low conservation potential) land. The restoration type that proved of the highest value in combining conservation and production was 'Reinvent', as it allowed the higher integration of conservation and production values. Six groups were generated, these were: layering up topography, patches and connections, cycling production, staged revegetation, layered riparian, and pest management from landmark. These groups and

concepts add to the ‘library of ideas’ available for stakeholders in the Mackenzie Basin. The successful interpretation and application of the groups and concepts generated through this thesis offers tangible pathways that could assist in shaping a landscape where different layers and levels of conservation and production interact and achieve the vision outlined in the Mackenzie Agreement.

Keywords: multifunctionality, design directed research, productive landscapes, Mackenzie basin, ecological aesthetics, legibility, perceptible realm, landscape architecture

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Preface

The New Zealand outdoors were a key part of what led to the pursuit of a career in Landscape Architecture. Each year of my life is punctuated with experiences in the New Zealand landscape. Winter is associated with the Marlborough sounds and the Southern Alps, Summer is inextricably linked to Central Otago and the Mackenzie.

Through the last 5 years, studying at the School of Landscape Architecture, first for Bachelor of Landscape Architecture, then a Master of Landscape Architecture has helped cement a passion for the New Zealand landscape. Running parallel to my studies, a family influenced interest in sustainability and permaculture arose as my parents moved to a 35-acre piece of land near Lincoln. Although it is far from the scale of the high-country stations throughout the country, it was enough to prompt the focus on sustainability and productivity throughout my studies.

With a more detailed understanding of the landscape, came a sharper perception of the patterns and actions that shape it. Every year, as we drove into the Mackenzie, there were greater numbers of weed species visible, as well as a greater proportion of green grass against the tussock. The attachment to the Mackenzie and understanding of the potential impacts of uninterrupted dairy expansion, drove the choice of my final year project. This focused of the stretch of state highway 8 between Twizel and Omarama, the site of the highest intensity irrigation in the Mackenzie. The resulting design focused not on obliterating the irrigation, but how the use of it could be adapted to be more appropriate for the setting, secure the future of those managing the land, while increasing ecological values and reducing tourism pressure.

When the decision was made to undertake this Masters, it was a case of rather than continuing that project, looking at the other areas in the Mackenzie, and investigating the potential value of those landscapes.

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Chapter 1

Introduction

Landscapes are complex, the Mackenzie Basin is no exception. The community of the Mackenzie Basin landscape have acknowledged the complexity of these conflict found in this unique landscape and pressures present (2013a). They have taken the first steps towards resolving these conflicts through the publishing of the Mackenzie Agreement (2013a) and the vision outlined within it. There have been projects undertaken that addressed aspects of the Mackenzie Basin (Derecourt, 2017; *Mackenzie Country Drylands Park*, 2016), according to and informed by the Mackenzie Agreement (2013a). However, the absence of actionable concepts accessible to the stakeholders, is an obstacle to achieving the vision, or an 'accommodation' between different land uses (Hutchings & Logan, 2018). One of the issues in balancing and integrating land uses is the perspective that certain values are allocated to landscapes according to their existing condition (Hutchings & Logan, 2018). In this regard and others, the Mackenzie Basin is representative of conflicts throughout New Zealand and worldwide. The unique landscape of the Mackenzie Basin requires a response to its landscape challenges, not to place the solutions developed for and in other landscapes (Swaffield & Brower, 2009), but to investigate the potential that may be found in generating a structured mix of concepts that can be used to further the achievement of the Mackenzie vision, but also to address issues regarding what defines a productive landscape, what these new productive landscapes could look like in the Mackenzie, the role of the existing landscape condition and the balance between conservation and production. The following section presents the context for this research, locating it in the biophysical, social, and design context of the Mackenzie Basin. The sections following review literature that relates to both the details of the Mackenzie vision and the Design Directed Research methods used in this research. Designed concepts generated for this study would be data gathered to address the research question. They are material that may have the potential inspire actions for the stakeholders in the Mackenzie Basin, through further collaboration (Abbott & Bowring, 2017; Duff et al., 2009; Meurk & Swaffield, 2000; Swaffield, 2013) while potential implications for the field of Landscape Architecture and Design Directed Research would be the material within this document. The following Mackenzie chapter presents the value of the Mackenzie Basin, and the opportunities that exist for the Mackenzie Basin to be recognized for its iconic values and unique landscapes.

Chapter 2

Mackenzie

The Mackenzie District in New Zealand is representative of worldwide issues, expressed in a landscape unique and rich, both in its biodiversity and history (geological and social). Particularly the areas below 800m elevation, identified as the 'Mackenzie Basin' (Appendix G). This chapter works through the ecological and cultural changes that have occurred, to provide an understanding of the biophysical and social context of this research. This is followed by an analysis of the community's response to these changes by the definition of a shared vision for the Mackenzie Basin. This thesis is informed by this vision and associated documentation as well as projects located in the Mackenzie Basin in response to the landscape change that has occurred. Summaries of the documentation and projects are also included.

"The challenge in the Mackenzie has been how to reconcile outstanding national landscape and biodiversity values with the need for local communities to maintain and develop their sources of livelihood" - Jacqui Dean, MP for Waitaki and Chairman of Trustees *(UWSVF, 2013b, p. 3)*

The above quote summarises the context and conflicts which are presented in the following section, and that are investigated through this research.

2.1 The Mackenzie Landscape

The Mackenzie Basin is an area rich in biodiversity and unique landforms, with extensive glacial moraines and outwash plains, accompanied by highly specialised and rare species – particularly birds and invertebrates (DOC, 2016). The Mackenzie Basin has experienced significant change from a "mosaic of forest, scrub, shrubland, and grassland" (McGlone & Moar, 1998), to the tussock grassland and modified pasture present that now extend across the Basin (McGlone & Moar, 1998, p. 109; Swaffield & Hughey, 2001). The majority of High Country tussock grassland is privately owned (Swaffield & Hughey, 2001). The dominance of grassland is the result of human driven change, through fires and pastoral farming (McGlone, 2001; Weeks, Walker, Dymond, Shepherd, & Clarkson, 2013). While the tussock grasslands may not be the 'original' vegetation cover in some areas, the Mackenzie Basin remains a valuable and at-risk ecosystem (DOC, 2016). As of 2013, one third (34%) of New Zealand grasslands have been converted to non-indigenous landcover (Weeks et al., 2013). This does not account for the more subtle forms of degradation that are present in the Mackenzie, such as loss of inter-tussock species diversity through grazing and weed invasion (Head, 2016;

Hutchings & Logan, 2018; Meurk, Walker, Gibson, & Espie, 2002; Norton, Espie, Murray, & Murray, 2006; UWSVF, 2013a; Weeks et al., 2013).

One threat to the Mackenzie Basin biodiversity is the highly invasive *Hieracium* species (Head, 2016; UWSVF, 2013a). Two approaches to managing *Hieracium spp.* are different grazing intensities (the reduction or removal of human management) presented by Meurk et al. (2002) and Walker, Comrie, Head, Ladley, and Clarke (2016) or increased irrigation and fertilisation (the increase of human management) presented by Norton et al. (2006). Norton et al. (2006) investigated the impacts of increased human input through irrigation and fertiliser application. The removal of human input may not be enough for the ecosystem to recover, in some cases, more management is required for vulnerable species to gain a foothold (Maloney, Keedwell, Wells, Rebergen, & Nilsson, 1999). There are invasive species in the Mackenzie Basin that are so aggressive that a "hands off" approach is potentially not sufficient (Newton, Fairweather, & Swaffield, 2002). The braided riverbeds and wetlands of the Mackenzie Basin are home to some of the rarest birds in New Zealand (DOC, 2016; Grzelewski, 2008; Head, 2016), management of the invasive weeds that choke the river beds is required to ensure the habitat and safety of these species (Bloomberg, 2001; Maloney et al., 1999). However, reducing the impact of and changes by humanity is recommended, alongside active conservation measures, otherwise we risk losing sensitive species before fully understanding them – or even knowing they exist (Emberson, Syrett, & Blakely, 2018; McDowall & Waters, 2003). The management for biodiversity can intersect with human management, such as angler and photographer feedback on the removal of weeds from Mackenzie waterways (Bloomberg, 2001). The same 'weeds' cause conflict as some of the community are expect to remove and manage species while others plant or utilise for production (Wardle, 2016; Worrall, 1998). The same conflict between conservation versus production applies to the use of water, where there are impacts on river and grassland habitats using water for hydro power generation or irrigation systems (Bloomberg, 2001; Maloney et al., 1999). This conflict between human pressures and the natural systems of the Mackenzie Basin is multifaceted, the production and conservation elements are intertwined with social and cultural connections, with a combination of cultural, historic, and economic links felt by the community, as presented below.

2.2 Tangata Whenua in Te Manahuna

Te Manahuna (The Mackenzie Basin) (Beattie, 1995) was first frequented by Māori for harvesting the abundant birdlife, as such the area was known to them long before the arrival of Europeans (Bloomberg, 2001; Taylor, 2016). There are accounts of a resident population until they were evicted after tensions arose with European settlers (MacLean, 2016). The tensions were driven by the

assertion that the inland area had not been sold to the Crown and belonged to iwi (Bloomberg, 2001). The Waitaki river is the cumulation of all the lakes and rivers found through Te Manahuna, feed by Kā Tiritiri o te Moana (Southern Alps) and associated glaciers. The area holds spiritual value to Ngāi Tahu (Swaffield & Hughey, 2001), due to the presence of Aoraki (Mount Cook), recognized as an ancestor and part of their identity. The Mahinga Kai values of the Mackenzie Basin have been degraded through European production driven landscape changes, including the introduction of hydro systems which impede Tuna (Eel) migrations and therefore populations of this historically valuable resource (Bloomberg, 2001). Ngāi Tahu continue to be involved in the management of the Mackenzie Basin (DOC, 2016; Hutchings & Logan, 2018).

2.3 Post 1800's connections

Beyond Tangata whenua, Aoraki Mount Cook, and the wider high country is a part of the wider New Zealand identity and cultural values (Swaffield & Hughey, 2001). Aoraki is the highest peak in New Zealand and its heights have been tempting climbers for more than 100 years (Grzelewski, 1996). It is unmistakable, and when viewed down the length of Pukaki on a clear day, to the following quote by Samuel Butler is irrefutable:

> *"No one can mistake it. If a person says he thinks he has seen Mount Cook, you may be quite sure that he has not seen it. The moment it comes into sight the exclamation is 'That is Mount Cook!'—not 'That must be Mount Cook!'"*
> *(Grzelewski, 1996)*

The Upper Waitaki District and Mackenzie Basin became known to Europeans after James Mackenzie was caught using the intermontane basin to rustle sheep. Due to the following infamy of the man and his loyal dog 'Friday', the region became known as Makenzie Country (Grzelewski, 2008). There is a statue memorialising James Mackenzie and Friday in the township of Fairlie (Figure 1). The modification of the Mackenzie Basin that was started by the burning of vegetation for Moa by the Māori, was continue by the introduction European farming techniques. There are additional statues to be found around New Zealand and the Mackenzie (Figure 2) memorialising the farmers and their loyal dogs who helped 'settle' the High Country, including the Mackenzie Basin (Barnett, 2017). The modification of the Mackenzie Basin and surrounding High Country continues to the current day, as described in the below.

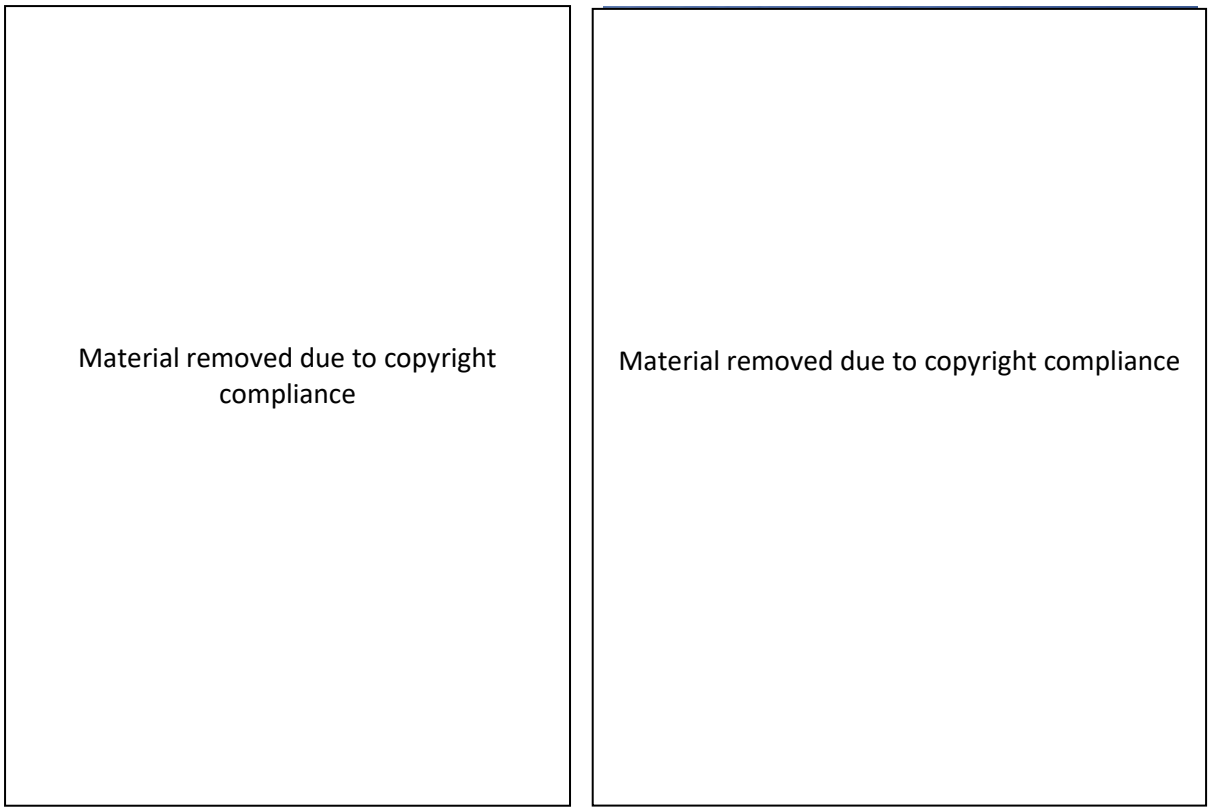

Figure 1: (Left) James Mackenzie and Dog. Retrieved from: https://doggymom.com/2011/10/30/james-mackenzie-and-his-dog/

Figure 2: (Right) Collie statue at lake Tekapo, paying tribute to the dogs without whom the 'grazing of this mountain country would be impossible'. Retrieved from: https://www.thingstodopost.com/the-10-best-things-to-do-in-lake-tekapo-new-zealand-128858

The influx of Europeans to the Mackenzie Basin prompted the division of the land into large High-Country Stations, leased from the Crown. The Mackenzie Basin retained the same status for decades until 1998 when a process called tenure review was initiated (Morris, 2014; Swaffield & Hughey, 2001). Through tenure review stations have been split into partially freehold title, and partially Department of Conservation (DOC) managed public conservation lands (Swaffield & Brower, 2009). This was carried out under requirements that tenure review process 'promotes ecologically sustainable management' (McFarlane, 2011a, p. ii). However, the division of land according to production or conservation values caused stakeholders to choose which they wanted to support, by either owning land utilised for production or managed for conservation and presented a binary in management approaches (McFarlane, 2011a; Swaffield & Hughey, 2001). In the early 2000's, the process attracted widespread public interest following a report asserting that the process was disadvantaging the Crown and therefore the public in comparison the runholders, who were gaining freehold over large areas of land (Morris, 2014). Therefore, in 2007, the Minister of Lands announced that properties with certain 'significant' values would not be subject to tenure review

(Morris, 2014). However, following a change of government in 2008, new policy goals were introduced (Morris, 2014). These focused on recognising the stewardship values embodied by those managing the land, and promoting good relationships between the Crown and individuals (Morris, 2014). Recently, the 'High Country Advisory Group' has been formed to address some of the tensions throughout the high country (Littlewood, 2018b). This is separate to, and in addition to the cooperation of those who are a part of the Mackenzie Agreement (2013).

One of the landscape changes in the Mackenzie Basin that has increased interest in both the tenure review and resource consent process is the change in the appearance of the Mackenzie Basin due to intensive irrigation, enabled by technology advancements. The Mackenzie Basin is home to the headwaters and catchment of New Zealand's largest hydroelectricity scheme. The visual abundance of water in lakes and canals is contrasted with the apparently arid landscape, which is again contrasted with the green, lush areas that have been grated irrigation consents (UWSVF, 2013b).

Mackenzie Basin is relevant to land use conflicts because many of the landscape patterns which epitomise the region are shaped and maintained by human involvement (McGlone & Moar, 1998). Any efforts to exclude humans in order to 'preserve' these landscapes would require accepting that landscape change will occur through natural succession (McGlone, 2001; Swaffield & Hughey, 2001). This is currently held at bay through grazing and farming processes (McGlone & Moar, 1998).

These farming processes are arguably as ingrained in the region's history as the recognition of the biodiversity (Weeks et al., 2013). The permanent community largely supports production as far as sustaining the community economically (Hutchings & Logan, 2018), whereas outside perspectives tend to focus on preserving landscapes shaped by historical processes and conservation – sometimes without consideration of the effect which this may have on the lives of the permanent community (Read, 2005).

In response to the range of conflicting issues in the Mackenzie, the community came together to define a vision. This pro-active approach to shaping the future of the landscape is defined below, as is the resulting vision.

2.4 The Mackenzie Vision

As presented above, there are many different, often conflicting aspects in the landscape of the Mackenzie Basin. The Mackenzie Agreement, authored by the Upper Waitaki Shared Vision Forum (UWSVF) responds to the challenge in the Mackenzie which has been how to reconcile these

outstanding national landscape and biodiversity values with the need for local communities to maintain and develop their sources of livelihood (UWSVF, 2013b).

The Mackenzie Agreement identifies the cooperation between 22 individuals and organisations (Appendix F). Each of the parties has a vested interest in the continued health of the Mackenzie, including the health of the biodiversity, and the ability for the land to support the community through provision of ecosystem services, essential for and present in production (McFarlane, 2011b).

The Mackenzie Vision, as identified in the Mackenzie Agreement is defined as follows:

- "A land use pattern which includes a mix of irrigated and dryland agriculture, tourism-related development, and land actively managed for biodiversity and landscape purposes, with integration of these wherever practical;
- A balanced and prosperous local community;
- New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets." (UWSVF, 2013a, p. 4)

Two key challenges identified by the Mackenzie Agreement in the context of agriculture in the Mackenzie are:

- "Protecting water quality, this is largely addressed by the existing statutory processes.
- Maintaining a healthy vegetation cover on the land through;
- managing the ever-present threats of animal pest and weed invasion."
  (UWSVF, 2013a, p. 7)

These three agriculture-based challenges are important as they identify specific issues that lie within the wider goals identified in the vision.

The Mackenzie Trust is presented as one of the key mechanisms to achieve the Mackenzie vision. The signatories of the Mackenzie Agreement assert there is need for a trust to improve relations and support between the different groups who care for and manage the land in order to collaborate in achieving the Mackenzie Agreements vision. Specifically mentioned are the damaged reputations of those who manage the land (UWSVF, 2013b). The second reason for the Mackenzie Trust is that, other than farming, there are few sources of revenue through restoration and land management

(UWSVF, 2013a). This is essential in the Mackenzie due to the constant pressure of the introduced and invasive species that compromise the health and character of the Mackenzie and the associated costs of managing them (UWSVF, 2013a).

The trust would provide support for the achievement of conservation goals, alongside the Mackenzie vision (UWSVF, 2013b). Primarily financial incentives and compensation for ecosystem services and conservation driven management (UWSVF, 2013b). The first way mentioned is through negotiation and collaboration with landowners, the trust would register the associated agreements and provide 'contributary payment' for the ecosystem services of those areas. In addition to this, the trust would manage a 'trade-off' process where areas of land with conservation value are set aside and managed for conservation. The trust would have a role in research and in the Mackenzie Basin and develop a certification for sustainably managed land in the Mackenzie (UWSVF, 2013b).

In 2017, the Mackenzie Country Trust Strategic Framework was published by the Mackenzie Trust as a guiding document for implementing the Mackenzie Agreement 2017-2018 (UWSVF, 2017). This document reiterates the information presented in the Mackenzie Agreement and refines the actions and drivers of the Trust. The need for collaboration between different shareholders and agencies is also mentioned (UWSVF, 2017).

The need for collaboration and understanding between different groups resulted in the commissioning of a consultancy firm to investigate 'Opportunities for Agency Alignment', and consequently a report that was published in February 2018. The purpose of the document was to "consider what more could be done to align land and water management decision making" (Hutchings & Logan, 2018, p. 5). The Opportunities for Agency Alignment Report investigated:

- Relevance of the Mackenzie Vision,
- How the agencies within the Mackenzie could contribute to the Mackenzie Agreement's vision,
- How legislative functions could be aligned,
- Identification of areas with intensification potential,
- Identify how agencies could contribute to the 'Drylands Park' concept,
- Suggest a more effective interface between the Crown Pastoral Land Act 1998, and the Resource Management Act 1991,

- A ‘better public services’ approach to situations with jurisdictional overlap. (Hutchings & Logan, 2018, pp. 52-53)

The interviews used to develop the Opportunities for Agency Alignment Report found that the Makenzie vision had continued support, but there were potential areas for investigation in how the stakeholders could progress the vision and what implementations the state of the landscape had on those efforts (Hutchings & Logan, 2018).

These resources (Mackenzie Agreement, Mackenzie Country Trust, Mackenzie Strategic Framework, Opportunities for Agency Alignment Report) are used to inform and guide the generation of concepts for the Mackenzie, as they provide numerous perspectives on the landscape and are intended to be representative of the community due to the breath of stakeholders interviewed (Hutchings & Logan, 2018; UWSVF, 2013a, 2013b, 2017). The results from the Opportunities for Alignment, and Mackenzie Agreement are largely areas that the community are united by their interest in, whether they have the same opinions regarding that issue or not. Some key findings from this report that are particularly relevant to the present research are that farmers wish to be a part of the solution, as partners in achieving the vision. Therefore, suggestions and future concepts need to incorporate farmers as a positive component, not an obstacle to be worked around. In order to clarify the role of different stakeholders, there needs to be clarity regarding the actions to be taken. Therefore, the other issue relevant to this research is lack of understanding for what the potential of the vision may look like, both overall and to those on the land. The Mackenzie vision has been defined in these documents in words only. The power of visualisation to inspire or provide a starting point to work off is important for understanding (Abbott & Bowring, 2017; Dramstad & Fjellstad, 2011; Nassauer & Opdam, 2008). The ‘Drylands Park’ concept and the ‘Mackenzie Drylands Natural Heritage Area’ are two iterations defined verbally through this document, but as large-scale overarching concepts for the Mackenzie. There is a need for of explicit, human scale options for the stakeholders to work through together (Heller & Zavaleta, 2009). Ideally these could be adapted to meet individual circumstances but are driven by the same vision. The generation of these concepts are the next step in achieving the Mackenzie Vision. The existing projects located in the Mackenzie are presented below.

2.5 Previous projects on the Mackenzie

Two previous projects that have been completed around the Mackenzie Agreement include the Mackenzie Country Dry-Lands Park by Landscope DesignLab and Lincoln University Students (Abbott, 2018; Abbott & Bowring, 2017; *Mackenzie Country Drylands Park*, 2016). The project examined the

potential distribution and phasing of the different land uses required to meet the Mackenzie vision. The design remained at the wider scale rather than human scale concepts.

The second project was titled 'The legacy of water' and focused on expressing the different impacts of water in the Mackenzie over time (Derecourt, 2017). The project was completed by myself as the final project as part of a Bachelor of Landscape Architecture focused on potential uses for the large-scale pivot irrigation in the Mackenzie. The design consisted of patterns of planting used to express the different histories of water and actions of individuals in the Mackenzie. The same patterns of planting were designed to have production and conservation values. This project was focused on the large areas of existing intensive irrigation along State Highway 8 in the Mackenzie Basin, Upper Waitaki Region (Derecourt, 2017). Between the two projects, the remaining area to be investigated, is the human scale areas that are not developed into large scale pivot irrigation.

These two projects respond to either the large scale (Drylands Park), or a specific landscape typology (Legacy of water). The opportunity exists for this research to investigate the possibilities of specific concepts that can be adapted and applied (distributed) across a range of contexts. Potentially set within a network such as that presented in the Drylands Park or 'Mackenzie Drylands Natural Heritage Area'. The complimentary application of these projects across scales and existing land use typologies has the potential to provide more a more detailed representation of the Mackenzie Agreements vision for the stakeholders and agencies to work together to refine at their different scales.

		Land use typology	
		Intensively irrigated	Dryland Production
Scale	Landscape Scale	Drylands Park Legacy of Water	Drylands Park
	Human Scale	Legacy of Water	The current research

Figure 3: Between the two projects, the remaining area to be investigated is human scale concepts in landscapes that are not developed into pivot irrigation

2.6 Conclusion

The Mackenzie landscape and cultural contexts reviewed so far are representative of the complexity that is found in the Mackenzie Basin. This complexity follows through to any attempts to explore solutions to the landscape conflicts present in the Mackenzie Basin. The Mackenzie Basin in New Zealand is the subject of ongoing investigations. The Mackenzie community has undertaken and published The Mackenzie Agreement to define the future of the region (UWSVF, 2013a). Through exposure to the other Mackenzie projects, questions arose about how these wider issues, generally

approached using landscape scale concepts, as seen in the documentation and previous projects could be resolved using Landscape Architecture and Design Directed Research (DDR). This was further clarified following the publishing of the Opportunities for Agency Alignment document (Hutchings & Logan, 2018).

The Mackenzie Basin is representative of New Zealand in the perspective that land can be managed for *either* conservation or production, and how this perspective is reinforced by social and statutory processes. This is seen throughout the consultancy documents, but no matter what the different groups see as the 'main' driver (conservation or production), all stakeholders cared for the continued health of the landscape (Hutchings & Logan, 2018). This thesis set out to ask if there can be a balance and integration of conservation and production in the Mackenzie Basin, and how could this be communicated to stakeholders in order to progress the Mackenzie vision? Could inspiring and empowering the stakeholders to work together through use of concepts that recognize their shared love of the landscape help to achieve the Mackenzie Agreement's vision? The research question and revised Mackenzie goals are identified below.

The research question this thesis focuses on is:

Is it possible to develop a structured mix of compelling multifunctional landscape visions for the Mackenzie Basin?

The question is addressed in this thesis through an analysis of existing theoretical concepts and available documentation on the Mackenzie district (Mackenzie Agreement and associated documents, alongside the Opportunities for Agency Alignment Report) informed the generation of concepts through design directed research. The concepts generated in this thesis were to provide a starting point for conversations between the different stakeholders.

The Mackenzie Agreement's vision (UWSVF, 2013a) was distilled into four goals that were emphasised for use in this research. They were:

1. Protect Water quality,
2. Maintain healthy vegetation cover,
3. Manage animal pests and invasive weeds,
4. Mix of irrigated and dryland agriculture.

These were shaped by the underlying drivers from the Mackenzie Agreement (UWSVF, 2013a) of:

- The recognition of the Mackenzie as a unique and valuable landscape.
- Land actively managed for biodiversity and landscape purposes, with integration of these wherever practical,
- A balanced and prosperous local community;
- New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets. (UWSVF, 2013a, p. 4)

Through identifying elements in the Mackenzie vision that relate to the combination of different landscape uses, and the understanding and investment of the community, these ideas can be recognised as being relevant to explore through academic theory. Prior to exploring these issues in a worldwide context, they must be understood in the New Zealand context. A number of New Zealand landscape issues are expressed in the Mackenzie. These issues are presented in Chapter three as they exhibit in the wider New Zealand context for the Mackenzie Basin. The connections and implication of these issues for the Mackenzie Basin are presented. The cultural influences on these perspectives is also covered. These definitions are followed by a brief summary of relevant landscape-based issues that are present in New Zealand but are representative of worldwide pressures. Chapter four reviews literature is a review of areas of theory relevant to the Mackenzie Goals, these serve to inform the concepts generated using the **Design** Directed Research methods. Chapter five reviews the Design Directed Research theory in the literature review that informed this research. Chapter six: Methods, outlines the process in which the literature and Mackenzie goals were brought together to inform the generation of concepts that to guide stakeholders in achieving the Mackenzie goals. These concepts are presented and discussed in Chapter seven: Results. Reflections on the findings, research process, and opportunities for further research, is presented in Chapter eight: Concluding discussion.

Chapter 3

Landscape in New Zealand

Following through from the complexity of the issues surrounding land use and social elements of the Mackenzie Basin, there are overarching elements that shape these values in the Mackenzie. These stem from on how the landscape is viewed and understood in New Zealand. The following section endeavours to provide an understanding of the wider setting of the Mackenzie Basin and this research. Some key terms used throughout the research are clarified as to how they are understood and used throughout this research and document. The defining of these terms is followed by a brief summary of social aspects of New Zealand's relationship with nature. This is then followed by a summary of the current biophysical issues in New Zealand that are expressed and relevant to the Mackenzie. These include the use of water and the development of land for human use. The way in which these issues are approached in the Mackenzie is influenced by national positions, therefore the possibilities explored for the Mackenzie could be used to inform and approach the same national issues that are locally expressed in the Mackenzie Basin. The first term to be defined is 'landscape' as the 'landscape' is both the setting for, and a part of the conflicts and complexities faced in the Mackenzie Basin.

3.1 Landscape

Landscape is defined by several authors in ways that are similar overall but different in their nuances. For Park (1998), landscape is the layers of physical impressions, as well as the connections that individuals form or experience over time. Meurk and Swaffield (2000) share this view, as they present landscape as something that embodies interactions between people, their actions, the actions of others, and their environment. This interaction is never static and is constantly evolving through the impacts of other humans and biophysical processes over time (Dramstad & Fjellstad, 2011). In 'Eternal Sunshine: The search for spotless landscapes' Bowring presents landscapes as 'unwitting autobiographies' as they give form to a variety of conscious and subconscious decisions and preferences (Bowring, 2010, p. 80). The 'Landscape' is as much the impact that humans have on one another, the values that are attached to a location, as it is biophysical process, both natural and man-made. Although these are not all immediately visually experienced, different experiences can add layers of understanding and values associated with an area for any individual (Meurk & Swaffield, 2000). Landscapes express individuals' beliefs and priorities through their actions and the corresponding physical impressions left (Bowring, 2010), due to the relationship between physical

actions and the social changes over time both the landscape and the levels of understanding evolve together over time. Landscapes evolve with humans, as they influence one another (Tress, Tress, Décamps, and d'Hauteserre (2001)). In this thesis, 'landscape' will be understood in a way shaped by these authors and perspectives.

'Landscape' includes the link between social values and resulting landscape, the presence of different physical patterns on any location express the associated values. Acknowledging the different facets of landscape results in understanding implications that landscape change is a result of social as well as physical processes, as presented by Tress et al. (2001), all landscapes have a natural and cultural dimension, and any attempts to segregate are counterproductive to achieving sustainable solutions. One element that can influence the recognition of landscape's complexity is picturesque ideology (Bowring, 2010). The impact of the picturesque is further examined below.

3.2 Influence of the picturesque

One of the key reasons for defining the above term "Landscape", is because there is the potential, especially in New Zealand, to be understood as purely the physical environment, which is then experienced visually, and this visual experience is informed by picturesque criteria (Bowring, 2010). One of these criteria is 'naturalness', if nature is presented as a landscape painting, it is likely to garner more support than those which do not resemble the perfect scene, as elaborated in the following sections. Therefore, the picturesque qualities are not an appropriate set of variables to exclusively judge a landscape against (Ellison, 2013). While there are those in any landscape that judge against to different values, according to their experiences and preferences (Egoz, Bowring, & Perkins, 2001; Gobster, Nassauer, Daniel, & Fry, 2007; Linné & Sellerberg, 2018), the level of understanding can change again based on whether the individual is a visitor or a permanent resident (Gobster et al., 2007). Emphasising this in the Mackenzie is important because the cultural layers and unseen landscape processes are what make the region unique as much as the appearance (UWSVF, 2013a). Recognising that these need to be expressed in a range of ways to a variety of viewers to achieve sustainability through the economic and social support for the landscape.

In New Zealand the picturesque is a remnant of the colonisation by European settlers (Stephenson, Abbott, & Ruru, 2010). Additionally, due to the long history of landscape being selectively framed to promote different regions or marketing for tourism, this is now what is often interpreted as a healthy, 100% pure, representation of New Zealand (Bowring, 1999).

The picturesque is one of the key drivers of landscape aesthetics in New Zealand (Bowring, 2010). An understanding of the origins, and the associated values serves to guide the generation of concepts

that use these values to achieve multiple goals in a way that appeals to New Zealanders - sometimes perhaps for reasons they themselves do not recognise. It is recognised in this research that, although the picturesque informs some landscape appearances, other criteria come into play regarding 'cues to care' and landscapes where the ideal aesthetic is one that expresses human management (Abbott, 2018; Gobster et al., 2007; Gobster, 1999; Nassauer, 1995; Swaffield & Hughey, 2001).

3.2.1 The picturesque

Appearance of the picturesque sits between the awe-inspiring extremes of the sublime, and the smooth, curved appearance of the beautiful (Bowring, 1997). It is a safer, more approachable wild than the sublime, but not so controlled it falls into the smooth, refined classification of being beautiful (Bowring, 1997).

In addition to the wider New Zealand context, the relevance of the picturesque is that the Mackenzie Basin doesn't tend to embody these values. The face of New Zealand's conservation landscapes are generally mountainous and forested areas (Abbott & Reeve, 2011; RNZ, 2018). The Mackenzie Basin areas of the wider Mackenzie and Upper Waitaki Districts are neither (UWSVF, 2013a). In order to progress, the positions that shape the existing landscape are important, understanding the origins may help to reveal the reasons for landscape preferences/associations. While ideally the aesthetic that prompted the most support would be that which enhanced ecological and economic values, this is not always the case, but familiar picturesque elements may help to progress support for the landscape aesthetic that is of highest value (Gobster et al., 2007; Nassauer, 1995).

3.2.2 Evidence of humans in the landscape

Evidence of humans maintaining the landscape to form the picturesque appearances described above is not tolerated, and to be disguised (Bowring, 1997). However, this results in a tension between *controlling* nature into a picturesque scene in order to *represent* the perfect composition of nature, which is not natural, due to the human management (Bowring, 2010, p. 79). Another point raised by Bowring is that, in not consciously recognising the impact of the picturesque, it has "masqueraded in other roles, such as ecological design." (Bowring, 1997).

Human involvement is an essential part of the Mackenzie landscape character (McGlone, 2001; McGlone & Moar, 1998; Swaffield & Hughey, 2001). By disguising any involvement of humans in the landscape, there is arguably a disservice occurring both for those in the landscape who are not acknowledged for their efforts, and for those experiencing the landscape who cannot locate themselves, or the possible effects of their actions in the landscape through understanding those of

others. As described in The Mackenzie Landscape (p.2), human management can be required to improve landscape health.

When discussing ecological design, and the relationship between aesthetics and ecology Nassauer and Faust (1995) relate that there are a number of issues in regarding the picturesque as healthy landscapes. One of these issues is that the scenic nature of the picturesque drives a desire to maintaining the same image; however, nature is dynamic, and in restricting changes, the health of the ecosystem may be affected. The second is that elements that add to the picturesque nature of a landscape may not be what they seem, they may be of man-made origin (e.g. Dramatic landform from mining) or be caused by other degradation of landscape health. The last point raised is that, just as areas that look healthy may not be, areas that are aesthetically unappealing may have the greatest biodiversity value. At this point understanding is essential in order to place value beyond appearance on a landscape (Nassauer & Faust, 1995; Nassauer, 1995).

As identified by Ellison (2013, p. 80), the impact of a lack of conscious recognition of the influence of the picturesque, particularly in landscape professions is that "the picturesque caricatures of nature that emerge in designed landscapes or landscape art are seen to represent nature itself". This furthers the impression of landscapes looking natural and attractive equals healthy and natural landscapes (Ellison, 2013; Nassauer & Faust, 1995). Removal of human involvement and reducing the landscape to only scenery results in a lack of responsibility for our actions, this is because it implies we are not a part of the landscape, when the actions of mankind are a key driver of change (Stephenson et al., 2010).

The honest expression of landscape values is essential to increasing understanding and investment in the landscape (Abbott, 2018; Gobster et al., 2007). A commitment is needed by all involved to present combined conservation and production values rather than segregating by function, as this results in valuing one over the other depending on the context and viewer. Viewers' understanding of the manmade/natural origins of a landscape's appearance is relevant in the corresponding understanding of the values of those individuals managing the landscape.

As Schama (1995) observes, even the landscapes that are viewed as free of human influence, are in fact overlaid with our culture, a position supported by Tress et al. (2001). Schama (1995) goes on to question the negative connotations of humanities presence in a 'natural' landscape. These 'natural' areas are potentially so highly valued due to their rarity (Abbott & Reeve, 2011). An alternative, positive perspective to human involvement is connected to recognising that human involvement can have positive effects – such as in pest management.

Particularly in New Zealand, the reality is that the impact of humans is inescapable. The introduction of exotic species and pasture has caused widespread changes to New Zealand's ecology, let alone the pre-European vegetation changes made by Māori (McGlone & Moar, 1998; Young, Norton, & Lambert, 2016).

Pursuit of picturesque values involved the removal of evidence of humans only in the implementation or management of the scene. The retention of certain features associated with other people's lives was deemed acceptable, just not the presence of those individuals themselves. These features could be structures, preferably in some rustic state or of a quaint nature, but the people and lives associated with their creating were far less welcome. The extremes of this occurred in England to the point of evicting tenants to maintain a perfect village scene (Stephenson et al., 2010). To an extent that is still present in New Zealand, by restricting the changes that can be made by those managing the landscape (Read, 2005), and with the showcasing of features in the landscape associated with historical practices (Figure 4, Figure 3). This occurs in from the residential scale, were farm machinery is used for garden ornaments, or the national scale. On a national or regional scale, it often exhibits as the memorialising of structures or locations of the industry that drove the development of that region. While in some cases it is a representation of the region's identity, for others it also continues the apathy/separation of the lives the user's lived, by reducing the elements of their lives to purely visual items. Like 18th century English upper-class parties leaving their estates for the day to paint the rural landscape and cottages, with no thought for the comparative quality of life of their occupants. In the Mackenzie Basin this exhibits as old wool sheds or sheep yards (Figure 4: Quailburn Woolshed), on the West Coast this contrast occurs as mining sites with equipment left to rust out in selected locations (Figure 3: Denniston Plateau). The upper-class painting parties are replaced with vehicle bound visitors and cameras, but still largely detached from the lifestyles the occupants of the landscape experience (Read, 2005).

In additional contrast to the idealisation of yesteryear practices, the modern-day practices associated with most industries are placed as far from public view as possible. There is also considerable community uproar if the expansion of industry will affect the appearance of the landscape, or the values it represents – such as marches in 2010 against mining (Stuff, 2010), or 2018 protests against dairying in the Mackenzie (Taunton, 2018). These industries (agriculture and mining), are the same as those that established communities and historic sites, they are the modern-day equivalent with associated new methods.

Material removed due to copyright compliance

Figure 4: Denniston Plateau, West Coast. Showing information panels and strategically placed mining equipment. Retrieved from: https://www.doc.govt.nz/parks-and-recreation/places-to-go/west-coast/places/denniston-area/ taken by: Baptiste Maryns

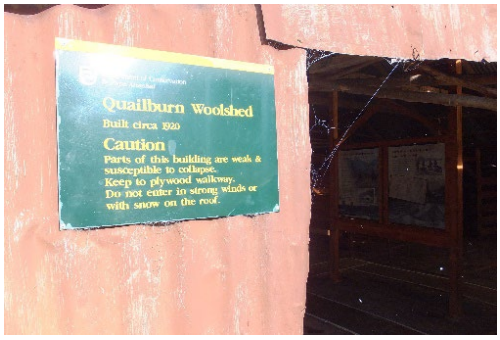

Figure 5: Quailburn Woolshed, Mackenzie. The raising of an otherwise mundane object/location to something of note through cultural and historical associations. Photo taken by: Jorden Derecourt

3.2.3 Dichotomy of New Zealand Landscapes

The extreme contrast between conservation and production landscapes can be connected back to a dichotomy in the New Zealand ideology of what can or should be done with a landscape, driven by the allocation of areas for one purpose (production) or another (conservation) (Swaffield & Hughey, 2001). New Zealand is covered in borders often identifiable from satellite, which have on one side – the untouchable reserves, national parks, conservation reserves, or other 'protected' state, on the other side of the line is production, and the associated land to be utilised, where virtually all indigenous biodiversity has been obliterated (DOC, 2016). Saunders (2013) appropriately describes this as 'fortress conservation'. This is partially due to the 'trade off' approach taken to intensification, as has been seen in the Mackenzie, where consents for intensification are granted under the condition that ecologically valuable areas are set aside and managed (Littlewood, 2018a).

There is potential for future landscapes to increase the level of integration of uses, to have a mix of production and conservation to enhance the value of all landscapes, not just those that are set aside and therefore valued for their rarity and untouchable nature. The perceived rarity of 'natural' areas is due to the conversion to pasture that occurred after the arrival of European settlers (Abbott & Reeve, 2011). The associations that drove this landscape change are explained below.

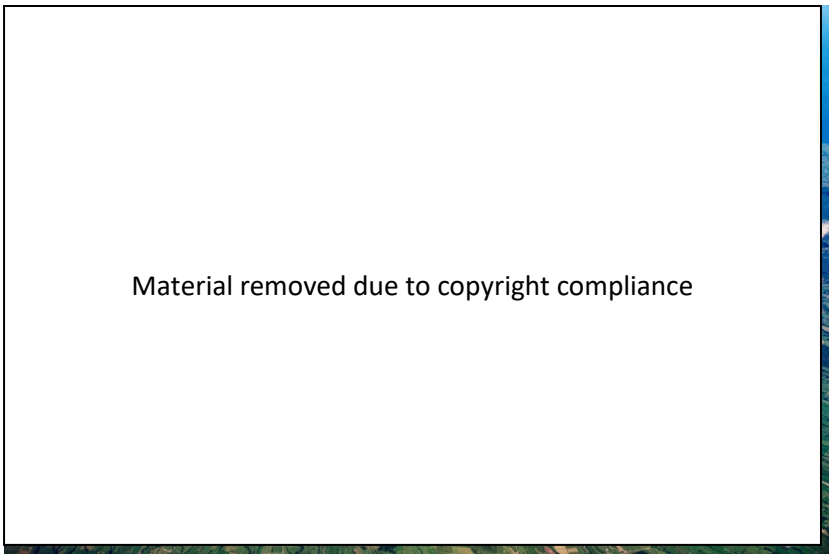

Figure 6: Image of Taranaki, and the harsh separation between Mt Egmont National Park, and the surrounding farmland. Retrieved from: https://www.amusingplanet.com/2016/01/mount-taranaki-and-egmont-national-park.html

As identified above, the majority of landscape changes stem from settler values. The two perspectives brought to New Zealand are recounted by Abbott and Reeve (2011). The first was that the wild areas of New Zealand were Eden lost, and must be returned to order and godliness through the efforts of humanity to redeem themselves, and following this, secondarily: that the untouched areas were for separation of one's self from others for contemplation and reflection (Abbott & Reeve, 2011). The sense of unpopulated areas as destinations for escape continues into the 21st century (Newton et al., 2002). The development of land driven by belief was based in stewardship and responsibility, a taming rather than obliteration. This positive association of efforts applied is discussed by Egoz et al. (2001); Linné and Sellerberg (2018); Nassauer (1995). The change was still extreme enough that the remaining areas of undeveloped land were prescribed as the spiritual antidote (Abbott & Reeve, 2011). Wonder at the natural world resulted in two levels of appreciation. The sublime, terror and awe in the face of humanity's insignificance in the face of god's work, and the picturesque – watered down and safer. The extremes of these are commonly identified according to land form, with the sublime suiting the alpine extremes, and picturesque the softer, lowland forms, but with dramatic elements.

3.2.4 Scenery Preservation

The link between the picturesque, which identifies landscapes and compositions that look like a picture and scenery, bear similarities to the backgrounds used in a stage set, emphasises the fact that these understandings are derived from artificial circumstances (Bowring, 1999). Therefore, basing our understanding of landscapes on these principles is not representative of the ecological and landscape health we associate with aesthetically appealing and conforming landscapes. This is elaborated by Gobster (1999), who identifies that the landscape readily presented through everyday life, and that which is visited for recreational or social reasons, is often no longer representative of a natural landscape. Increasingly, the landscapes which individuals identify with through media and imagery, is 'naturalistic', not actually, or representative of, a natural or healthy landscape. The alternative to this, to be explored through this research is the possibility that landscapes that bear clear human impacts can also be ecologically healthy (Abbott, 2018).

The majority of New Zealand National Parks and reserves are in areas of steep or elevated topography, as these were the picturesque areas that did not immediately lend themselves to production (Abbott & Reeve, 2011; Nightingale, 2003). The area and topography of the Mackenzie Basin that is the focus of this research in the land below 800m above sea level, and relatively even (Hutchings & Logan, 2018). See Appendix G: The Mackenzie Basin Area.

The creation of reserves was occurring in New Zealand by 1840, and in 1903 The Scenery Preservation Act came into act, a legal representation of values applied to the landscape at the time. In 2003 a document was published by the Department of Conservation titled "Our Picturesque Heritage: 100 years of scenery preservation in New Zealand" the proposed impact of which was to be the "first law that permitted the government to set aside land for aesthetic, scientific, historic and natural curiosity values." (Nightingale, 2003, p. 5). The first locations were chosen based on community consultation, and were the sites deemed beautiful, interesting, and significant (Nightingale, 2003, p. 3).

The Mackenzie Basin landscape character that inspires those to visit or live there is more difficult to define spatially as it is the amalgamation of the elements of the Mackenzie Basin rather than the individual 'beautiful, interesting, or significant' features that make it unique. It is the long, clear air views and expansiveness, the sense of being in a continent (Hutchings & Logan, 2018), these are difficult to define spatially (or place a border around). Future landscapes in the Mackenzie Basin therefore must layer both aesthetics and functions to maintain a consistent character that supports the character, history, biodiversity, and community.

'Our picturesque heritage'(2003), and the perspectives it presents are representative of the depth in which the visual qualities of the landscape are valued throughout New Zealand (Nightingale, 2003). However, it also notes how, when the Scenery Preservation Act was implemented, one of its justifications was the prevention of privatisation and destruction of certain landscapes. This could be understood as implying that the landscapes were not safe in the hands of private individuals. This could then further indicate that the landscapes which were under private ownership were either: not worth preserving, or; private individuals could not be trusted to appropriately manage them. This may be because the landscape is a 'lived experience' for residents, but reduced to 'scenery' by visitors, resulting in different associated values (Read, 2005). Therefore, in the process of managing the landscape, changes may be made that acknowledge the presence of humans and therefore reduce the scenery value to the visitor (Read, 2005). The ability for an area of land to be possessed by an individual and hold both conservation and production/residence value is a concept that has the potential to be realised through the achievement of the Mackenzie Agreements vision (UWSVF, 2013a).

The landscapes designed through the research completed in this thesis need to communicate that those managing the land are invested in the health of the landscape (Hutchings & Logan, 2018). There is the potential for greater public understanding and support (Gobster et al., 2007), as well as a cooperative relationship between government organisations and private landowners, to the benefit of the landscape, as requested in the Mackenzie documentation (Hutchings & Logan, 2018). Private and public parties working together would ideally result in an overall increase in landscape health, which remediates some of the damage done by decades of separation and addresses the Mackenzie Agreements vision and sustainable future.

3.2.5 Impact of separation

In the 21st century, the distance between the main centres of New Zealand, which are largely coastal, and the reserved areas is significant, resulting in the urbanised community needing to make a concerted effort to experience any area resembling wilderness. Unfortunately, this distance (Figure 7) reinforces the separation between the revered 'natural' areas, and the landscapes in which much of the population spend 90% of their time (Maseyk, Dominati, White, & Mackay, 2017). Ellison (2013) discusses how the separation and perspective that nature is somehow 'out there' results in a devaluing of the landscapes which are utilised during everyday life, this 'trade off' perspective has recently been applied to the consents granted for intensification in the Mackenzie Basin (ECAN, 2018). This separation has played a role in the creation and the resulting impacts of New Zealand's landscape issues, which are described in the following section.

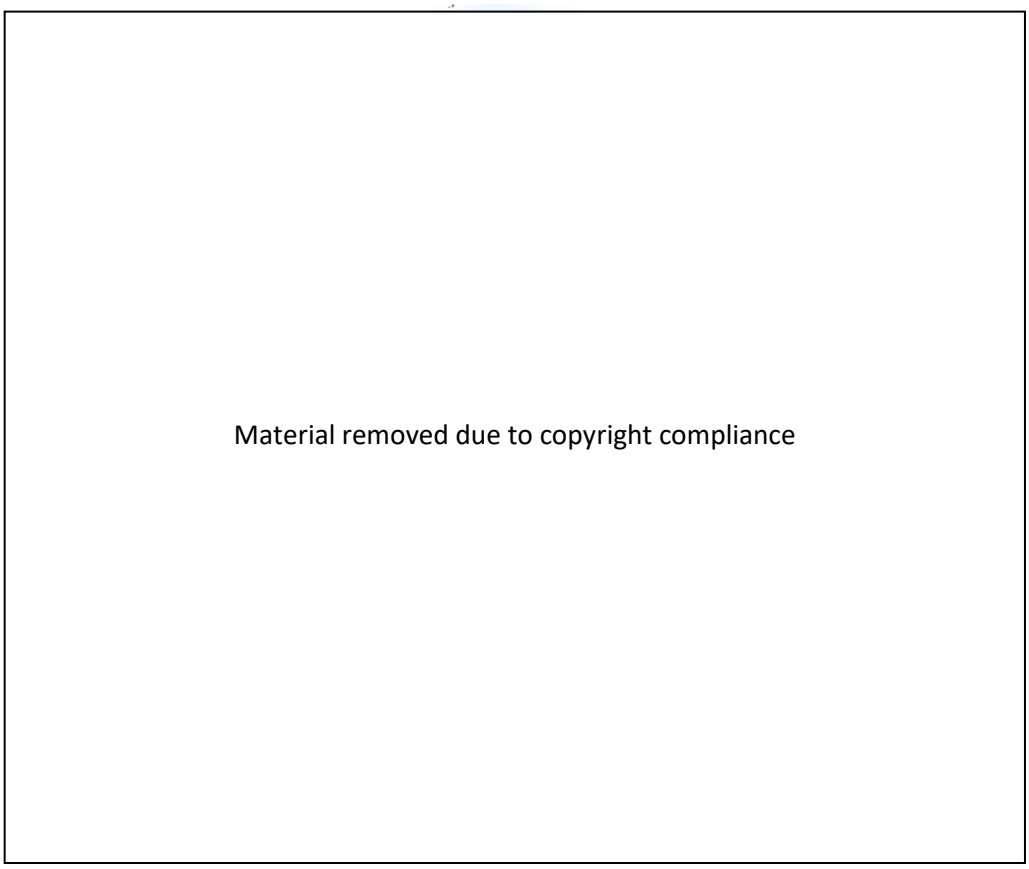

Figure 7: Map of the National Parks throughout New Zealand, with relative locations of main centres. Retrieved from: https://www.tourism.net.nz/visitor-information/national-parks

3.3 New Zealand landscape issues expressed in the Mackenzie Basin

Water and biodiversity are issues that are prominent in many environmental discussions, and especially so in New Zealand (RNZ, 2018). The quality of New Zealand water and the health of our biodiversity is under threat, and what actions to take are widely contested (Maseyk et al., 2017; RNZ, 2018). One of the most widely publicised contributors to this decline is the agricultural industry as such there has been increasing pressure on the to improve practices to ensure fewer negative impacts, and ideally some remediation of previous impacts on biodiversity and landscape quality. In the Mackenzie documentation, the damaged reputations of those managing the land are discussed (UWSVF, 2013b). Recently there has been a shift in production type in New Zealand from sheep (wool and lamb) farming to dairy farming (Ministry for Primary Industires, 2012). This intensification has resulted in an increased area of monocultural pastures, increased use of chemical fertilisers and the expansion of irrigation, particularly using pivot irrigators (Ministry for Primary Industires, 2012; Woodford, 2008). The expansion of intensification allowed by irrigation has been confined in the majority to the more even topography, while the mountainous country has retained the conservation status or large station status that it has had for decades (RNZ, 2018). This is a

representation of the picturesque preferences and dichotomy of New Zealand landscapes presented in the previous section (Influence of the picturesque p. 14).

New Zealand's pastoral history heavily features large tracts of land being held under lease, however recently under the tenure review process, some of these areas have become freehold, for the owners to operate on with considerably less restrictions than imposed earlier when the same land was Crown owned, in some cases resulting in subdivision and land use change (Swaffield & Brower, 2009). Land that is of conservation value has been retained in Crown ownership and therefore is now for the most part under the Department of Conservation (DOC) management. This also provides logistical issues as it increases the already large area that the department is responsible for, which in 2017, was around 9 million hectares of public land (Mitchell, 2017a). However, the recent government change has resulted in an increase in budget, including specific funding for the Mackenzie Basin biodiversity (Cooke, 2018). The amount of protected and publicly accessible land in New Zealand is a point of national pride, but also be a source of economical and logistical issues, which can lead to compromises needing to be made in the management of these areas (Mitchell, 2017b). While the land is freehold or privately owned, it is subject to the Resource Management Act 1991.

The Resource Management Act 1991 (RMA) is the governing document for environmental management in New Zealand. It is formed around the key principles of sustainable and integrated management of resources and including public in these decisions (*Environment Guide*, 2019)

The RMA is a significant document in New Zealand because it specifically identifies that the need for *sustainable management* of resources. Sustainable management is to be included in the use, development and protection of resources (Taunton, 2018). The explicit direction for the protection of New Zealand's natural and physical resources is representative of Nationwide recognition of the value of these resources, for aesthetic reasons or otherwise. The sustainable management is intended to support the social, economic and cultural wellbeing of communities and the individuals within them (*Resource Management Act*, 1991). The assertion that these three types of wellbeing can be achieved at the same time is interesting and relevant to this research as productive landscapes are driven economically, and conservation landscapes may social and cultural, but the combination of both, with the support of the RMA, hold the potential for new typologies of landscapes in New Zealand. As noted by Read (2005) , the combination of scenic and biophysical impacts is recognised in the RMA as necessary for a quality environment. This integration of scenic elements links the picturesque heritage of New Zealand through to governing documents of the 21st century.

Additionally, the purpose of the RMA also is to protect the life supporting capacity of natural systems on which humanity depends (*Resource Management Act*, 1991). Possibly one of the most instrumental is water. In land use and development discussions, water is the centre of much debate in New Zealand and the Mackenzie, as discussed in the following section.

3.3.1 Water

There are several renewable energy sources in New Zealand, with extensive Hydro schemes harnessing some of the largest rivers (Bloomberg, 2001). Although there are still many rivers that could be developed, the potential for climate change to effect the reliability of these as an energy source combined with public backlash to new proposals mean the focus is on other areas (*Hydroelectricity*, 2018).

The lakes and canals associated with the hydro schemes are recreation destinations for those interested in a range of recreation pursuits, but they also are costly to construct and change the character of the original waterway (*Hydropower: Innovation based on knowledge*, 2005). This exchange of an existing or historic character for economic reasons is present in the Mackenzie through the increase of irrigation. This leads into the role of water in production.

New Zealand rivers are under pressure as a 'resource' by farmers to increase production. The previous Federated Farmers CEO was quoted pushing for the ability to store more water to continue to feed an increasing population in a changing climate "If things are going to get hotter, then we need to store water. It gives options and allows us to survive and thrive. New Zealand has been backward over water storage because we waste so much of it, it just flows out to sea."(Hutching, 2014). It may be possible to understand this perspective in the Mackenzie where there are huge amounts of water, apparently doing nothing. However, the impacts of agriculture on the waterways of New Zealand is not to be dismissed, and is the focus of the community and wider New Zealand (Hughey, Kerr, & Cullen, 2008).

The Canterbury region, in which the Mackenzie Basin is located, features nationally rare braided rivers (DOC, 2016). These rivers would naturally meander across wide beds and plains with changing paths of multiple streams (*Braided rivers of Canterbury*, 2006). However, there has been ongoing issues of development encroaching on and restricting the path of many rivers. At one level, this detrimentally affects the health of the river bed ecology, and on the other, it risks any structures, animal, people or systems that are in the path of the river during a flood event. The river corridor is managed by councils and government departments but grazing or use of river beds is not uncommon by individuals whose land borders a waterway (Mitchell, 2017a). Hydro schemes also

impact braided rivers as the controlled nature of waterflow can remove the seasonal flooding that change flow routes and clear vegetation. Keeping areas of shingle clear is important for the lifecycles of many native species for breeding and protection from predators (DOC, 2016; Maloney et al., 1999).

Hydro development and production pressures on the rivers are both a result of increasing pressure on natural resources. This comes from an expanding population resulting in land use change and development.

3.3.2 Land Development/ Land use change

The worldwide issue of urban sprawl consuming rural land and fragmenting natural habitat exhibits in New Zealand through the 'Quatre acre dream'(Smith, 2017). A leftover from the days of colonisation is the idea of owning your own home and land. Though recently there has been an increase in urban infill and new builds being more medium density, it is seen as "Just not the kiwi thing" and as such, medium density developments are having trouble getting the same uptake as subdivisions offering house and land combinations (McDonald, 2017).

One example is of a land developments and a growing satellite town is Kingston, on Lake Wakatipu, which has a large proposed residential development to allow for the tourism growth and requirements of Queenstown (Taylor, 2018). Queenstown is an example of human demand extending beyond the capacity of a landscape, resulting in a change of character and systems. The same could be said of the Mackenzie, with technology progression (such as irrigation) and social demand placing pressure on the landscape, resulting in landscape change.

3.4 Conclusion

The first point that made by this chapter is that landscape is more than just the physical form. In New Zealand, high values are given to landscapes that are consistent with the picturesque aesthetic, influenced by New Zealand's colonial history. Sustainability dilemmas arise when the aesthetic ideals are not representative of, or are not, healthy ecologically or socially. The worldwide issues surrounding population growth, resource use, and climate change are present in New Zealand, and increasingly exhibited in the Mackenzie. The points presented through this chapter are not an exhaustive list of the elements for consideration through this research. The spread presented here demonstrates the complexity of 'landscape' and the environment in New Zealand.

Landscape embodies and represents the different values and experiences of those within it, past and present. These experiences and values can be different between individuals, resulting in tension

(Read, 2005). However, there is public resistance towards changing expectations and lifestyles to remediate this. There is pressure on the agricultural community, because of the impact of certain industry practices on resources, particularly water. Therefore, landscape change needs to facilitate the protection of unique biophysical qualities, and encourage value placed on the landscapes that are utilised to support the population, and a more sustainable use of resources.

Through an understanding of the Mackenzie Basin, including how it represents and relates to wider New Zealand issues, and considering the previous work completed, three values were identified. The first was the dissonance between the picturesque precedents of New Zealand reserve areas, and the Mackenzie landscape. The conditions of the picturesque that were identified in the section 'Influence of the picturesque' (p. 14), and the habitats and landforms typically set aside for conservation are dissimilar, or more difficult to identify in the Mackenzie Basin. The second was the additional conflicts introduced through technology advancements enabling pivot irrigation in the Mackenzie Basin, and the resulting landscape change. While previously the land use conflicts in the Mackenzie Basin maintained a relatively consistent character, and relationship with the habitats and species, the introduction of pivot irrigation brought with it a rapid change in character and landscape conditions. This appears to have not been aligned with the community vision for the landscape. Which leads to the third value, the relationship between these landscape qualities and the community identity of the region. These represent the conservation, production, and social values of the landscape. All three combine in the overall challenge for this research which focuses on presenting the potential for combining land use types, rather than increasing the demarcation between land uses and their associated values and how to enable the successful application of positive landscape change.

To consider the potential options, a literature review of potentially relevant theoretical concepts is now undertaken. It is necessary to understand the cultural and physical context for this research, as the issues examined here are underlying drivers for the landscape change in the Mackenzie. They also provide outside readers with an understanding of New Zealand and Mackenzie's unique qualities. The setting of the Mackenzie within New Zealand is important to inform the concepts and achieve the Mackenzie vision. Theory relating to the landscape issues identified in the Mackenzie goals and documentation are analysed in the next section in order to inform the generation of concepts. The themes throughout the literature review link back to the Mackenzie goals and drivers.

Chapter 4

Literature Review

Landscape Architecture is a 'blend' of different areas, according to Van Etteger, Thompson, and Vicenzotti (2016, p. 80), as quoted below.

> *"'Landscape architecture is […] a blend of science and art, vision and thought. It is a creative profession skilled in strategic planning, delivery and management. Landscape architects bring knowledge of natural sciences, environmental law and planning policy. […] And they create delight with beautiful designs, protecting and enhancing our most cherished landscapes and townscapes' (Landscape Institute 2012: 1)."*

Therefore, the first section of the literature review is divided into two sections of theory and covers areas of both the biophysical and social aspects of the landscape ('Landscape' as defined on p. 13). This biophysical sub-section examines relevant theory on multifunctionality, conservation, restoration. The social section covers aesthetics and legibility. There is considerable overlap between areas the of theory required to answer the Mackenzie goals. This is because the separation of these values into different areas of theory and separate sub-sections is not present in the landscape (Naveh, 2001). To represent this overlap, the goals most directly applicable to each area of theory are listed in Figure 11. The second section of the literature review is in part, a prelude to methods section, as it includes the literature that formed the structure of the design process. Followed by literature which informs how this information will be shaped into concepts through Design Directed Research to 'protect and enhance' the Mackenzie through this research (Design Directed Research p. 49).

Points discussed through the literature that are could be used to inform the achievement of the Mackenzie Agreements vision included: the need for human scale, actionable concepts, across a range of theory; multifunctionality was presented as a tool for combining multiple values in the landscape; beyond the need for specific actions, there is also a need for examples of New Zealand typologies; and actions that express the values of individuals and a community need specifying and application to a multifunctional context.

The Opportunities for Agency Alignment Report identified that multifunctionality was important for achieving the Mackenzie Agreements vision (Hutchings & Logan, 2018; UWSVF, 2013a). The first section analysed is multifunctionality, as it is an overarching theme in the Mackenzie documentation. Multifunctionality is also a key tool for the combination of different landscapes for

sustainability. The following sections are considered within the recommendations and gaps in the realm of multifunctionality, so to collaborate in achieving landscape change.

4.1 Multifunctionality

Tress et al. (2001) describe “multifunctional landscapes” as referring to the different processes in nature and society that take place in the landscape. The multifunctionality comes from the interaction of material, mental and social processes. Their description also states that “Multifunctionality exists in all landscapes through the co-existence of ecological, economic, cultural, historical, and aesthetic functions.”(Tress et al., 2001, p. 140). Therefore, the more ecological, economic, historical, and aesthetic functions present in the landscape, the more multifunctional it is. The balance of these functions may be site specific, but overall, the inclusion of multiple is a starting point for achieving multifunctionality. This co-existence of functions is one of the key drivers for combining the otherwise separate landscape types (production and conservation) in the Mackenzie (UWSVF, 2013a).

Figure 8: Multifunctional landscapes in relation to economically, environmentally, and socially driven landscapes (Lovell & Johnston, 2009b, p. 44)

In the literature reviewed, multifunctionality is a tool (or strategy) for improving the sustainability of landscapes. As stated by Lovell and Johnston (2009b) from the field of landscape ecology, there is gap between research and applicable designs based upon this information. They discuss how multifunctionality is a tool that can create solutions that offer specific design guidelines, whilst achieving multiple goals. These goals can be from ecological, economic, and social realms due to the possibilities afforded by multifunctional landscapes, as can be seen on Figure 8: Multifunctional

landscapes in relation to economically, environmentally, and socially driven landscapes (Lovell & Johnston, 2009b, p. 44). These authors also quote Hough (1995) in stating that creatively designed landscapes (specifically working landscapes) are a platform for different functions in the landscape. These include human-driven systems such as economy and society, and natural systems such as ecology (Lovell & Johnston, 2009a). This literature shows that there is the opportunity for this research to add value to multifunctional research by investigating potential applicable designs through the Mackenzie. The combination of landscape functions in the landscape requires the consideration of multiple systems at once that are otherwise viewed as separate. A holistic approach is one of the key aspects in designing multifunctional landscapes.

4.1.1 Holistic approach

Naveh (2001) advocates for a holistic view of landscapes to achieve multifunctionality. Naveh (2001) also highlights the logical correlation between bringing together multiple professions to achieve multifunctional landscapes and mutually beneficial relationships humans have with the landscapes they inhabit, due to the various layers of understanding that can be applied to any given landscape. In the Mackenzie, there is progress being made in this regard as the Mackenzie Agreement is a tangible expression of a range of community groups coming together for the health of the landscape.

The view of sustainable landscapes as a “triple bottom line” system needs to be exchanged in favour of a perspective that views the human landscapes as being “nested” in larger systems, such as the earths life support system. As shown by the Figure 9 below, by (Fischer et al., 2007). Sustainability is these systems being recognized as being hierarchical but interconnected, for the biophysical systems are essential to society, and a functioning society is essential to a successful economy.

This sense of interconnection is also created in the Mackenzie agreement vision which seeks to mix production, conservation, and tourism land uses to ensure sustainability (UWSVF, 2013a). The Mackenzie community was founded on primary industries, which are dependent on the continued health of the landscape (Hutchings & Logan, 2018).

Figure 9: Nested Sustainability diagram which shows the interrelation of different functions in the landscape, all dependant on the Earths support systems (Fischer et al., 2007, p. 622)

The Mackenzie Agreement and vision represent recognition by the community that their livelihoods are dependent on the landscape and the industries it supports. The recognition and understanding of the role of and services provided by a healthy landscape leads to the valuing of those services. A multifunctional landscape produces 'outputs' that are valued in different ways, as explained below.

4.1.2 Non-commodity outputs and commodity outputs

Wiggering et al. (2006) identify that the key aspect of "multifunctionality" is the production of commodity outputs (CO), which are produce or materials that are then paid for/sold. These occur in multifunctional landscapes alongside the production of non-commodity outputs (NCO), such as landscape aesthetics and ecosystem services which are currently viewed as public goods. (Wiggering, Müller, Werner, & Helming, 2003). In New Zealand and the Mackenzie, the appearance of the landscape is a cause for much debate, particularly when the opinions of landowners and the general public or wider community differ (Read, 2005). The identity of New Zealand is wrapped up in the appearance of our landscapes – so why is its value often bypassed in landscape management

choices? The combination of land uses serves to combine the commodity outputs of production and the non-commodity outputs associated with conservation.

This is encouraged in the literature, with authors observing that the effects of agriculture are being recognised globally, and the public pressure for non-commodity outputs is creating a market for them (Wiggering et al., 2006). As the process of NCOs becoming marketable changes them to COs, Wiggering et al. (2006) suggest a new classification, defining an indicator of social utility (SUMLU). 'Social utility' in the article covers environmental and economic services, with the unifying factor of the public creating demand for them.

This presence and evolving nature of each classification is important for the design of future productive landscapes because the indication of multiple functions that may be NCO's currently, could evolve to be classified CO or SUMLU.

Another link to the Mackenzie Basin context identified in the literature are the opportunities afforded by agricultural landscapes, where multifunctionality can improve landscape performance by enhancing multiple functions (including ecosystem services), through the combination or stacking of these functions (Lovell et al., 2010). However, this contrasts with a focus on conventional production, and dichotomy between production and conservation which is the current operational model in the Mackenzie Basin (Abbott & Reeve, 2011; Hutchings & Logan, 2018). Conservation is examined in the next section, with the underlying theme that multifunctional landscapes are the basis for the integration of the following sections of theory, including their different functions.

4.2 Conservation

This section shares material with the restoration section below due to conservation being a complex subject, of which one of the existing areas of theory is restoration. Restoration, however, is latter segregated out into another sub section. Therefore, in the coverage of conservation in this section, there is material which is related to the restoration section.

Due to the effects of climate change, Lawler (2009) states that landowners will need to work through different scales, manage in an adaptive manner, and focus restoration on facilitating future ecosystems services. This is in contrast with the current New Zealand model based on setting biodiverse land aside in isolated patches and removing it from the management of private individuals (Meurk & Swaffield, 2000; Nightingale, 2003; Read, 2005). For the Mackenzie Basin, there currently are widescale actions and recommendations, for a long time this has included the setting aside model identified above. (Hutchings & Logan, 2018). According to the literature, this is no

longer the appropriate model to enable the landscape and biodiversity to adapt to change (Lawler, 2009; Opdam & Wascher, 2004; Richardson et al., 2015). However, there is the potential for investigation in the human/individual scale, aligned with the literature to ensure biodiversity conservation.

Heller and Zavaleta (2009) review 113 papers across two decades of conservation recommendations and discuss the availability of actionable designs. This review identified that across the literature there is a dominance of 'general principle' recommendations, and that there are less that are 'actionable' by individuals in the landscape. This theme is common across the literature through the review, with large bodies of theory supporting general suggestions to improve landscape sustainability, but with less addressing what individuals can do (Heller & Zavaleta, 2009). Nassauer and Opdam (2008); Swaffield and Deming (2011) present design as a tool for the creation of spatially explicit, actionable concepts. As noted earlier in the Henley Hutchings (2018) report, this is a relevant connection to Mackenzie country as although the stakeholders agree with the vision of the Mackenzie agreement, the next steps are less clear (Hutchings & Logan, 2018).

To assist in the clarification and creation of actionable suggestions through this research, the wider theme of conservation is broken down into subsections. The subsections are broken down into 'Removing threats and reducing stressors' and 'Network of protected areas'. Removing threats and reducing stressors relates strongly to the Mackenzie goals of 'Managing animal pests and weed invasion' and 'Maintain healthy vegetation cover on the land' (p. 6). The conservation literature 'Network of protected areas' relates to the restoration theory and the Mackenzie driver of 'Land actively managed for biodiversity and landscape purposes, with integration wherever possible' (p. 6)

4.2.1 Removing Threats and Reducing stressors

The removal of other species that are either non-native or species that are having a detrimental effect on the ecosystems (and are not there due to climate changes) is suggested. Aspects to be reduced are the presence of invasive exotic species, habitat loss, fragmentation, and the overharvesting of resources. This is intended to result in larger populations that are more capable of absorbing climate changes (Lawler, 2009). Reducing the stressors of habitat loss and fragmentation can be done by ensuring a network of protected areas, as explained in the following sub-section. As presented in The Mackenzie Landscape (p. 2) sometimes the landscape change is such that the removal of human input and associated stressors is not enough to allow the landscape to recover (Maloney et al., 1999). There are large areas of modified landscape in the Mackenzie, both by direct

human modification/development and through degradation by exotic species. Appendix D: Modified Landscapes shows the change in the amount of modified area over time.

4.2.2 Network of protected areas

Opdam and Wascher (2004) suggest a shift in conservation measures, from individual species, to landscape conditions that facilitate biodiversity. This involves creating a landscape that allows species to shift and adapt to landscape changes. They also identify a need for a strategy that is less 'protected areas' and more 'network containing protected areas', with a variety of landscape management techniques. Opdam and Wascher (2004) assert that this strategy is needed as the current conservation model will waste money and resources setting aside finite areas that do not have the scale or capacity to absorb changes. These two models are compared in the project by DesignLab (*Mackenzie Country Drylands Park*, 2016). As identified in 'Previous projects on the Mackenzie' on page 9, there is an absence of human scale actions. Defensive conservation is intended to be utilised as a landscape development strategy in this model. This is due to the argument that it is adaptable and dynamic and can work alongside other landscape functions. Defensive conservation is different to 'fortress conservation' which is mentioned by Schama (1995) in the Dichotomy of New Zealand Landscapes section (p. 18) as New Zealand's current model. Defensive conservation requires enabling adaptable movements for future change, where fortress conservation isolates one area so to protect it. In doing so, the fortress method removes the capability for species to migrate with climate change (Opdam & Wascher, 2004; Schama, 1995).

A New Zealand research article comparing fortress conservation to the network approach found that protecting individual locations based on the presence of rare species will not meet wider conservation goals. Networks of wetland areas of a variety of sizes are necessary to support species richness and rare environments. Ideally the two aspects would work together – with rare species and rare environments included in the network (Richardson et al., 2015).

Lawler (2009) supports the creation of networks to facilitate movement of species to different climatic zones as the environment changes. They identify four different models for achieving this. With the options being to enlarge existing reserves, to span climatic or edaphic gradients, to facilitate directional species movements in response to increasing temperatures, and to help connecting existing reserves. Appendix E: Reserve, conservation and freehold land

The creation of a network can be supported by the increasing of connectivity. Lawler (2009) identifies two ways to increase connectivity, the first is small stepping stones of reserves to facilitate movement, the second is management of the land between the reserves to soften the matrix.

Permeability is one of three aspects to contribute to biodiversity, alongside heterogeneity and stabilising key areas, and it is intended to allow species movement through the landscape. Heterogeneity (increased variation within landscapes) to make populations less vulnerable to climatic variability. Stabilising key areas as the base for a network will be more successful if the key areas are healthy enough to support a population. Large areas of the Mackenzie Basin are degraded through development or weed invasion, see Appendix D: Modified Landscapes. Therefore, some sites may need restoration to function as the key areas. Restoration literature is reviewed in the following section.

4.3 Restoration

Seabrook, McAlpine, and Bowen (2011) discuss three different approaches to landscape restoration in changing landscapes, ('Restore', 'Repair', or 'Reinvent') with a view to how each of the approaches will develop in the future. The restoration types are also allocated generally to certain landscape types, dependant on the current condition and level of modification that has occurred (Figure 9: Alignment of restoration and landscape condition). As referenced by Seabrook et al. (2011), Harris, Hobbs, Higgs, and Aronson (2006) state the role of restoration as being to identify and help implement goals for the continued persistence and adaption of native species, and the associated ecosystem goods and services. This links to the features identified in the conservation literature where any management should be focusing on allowing for the adaption (specifically movement) of species in response to climate change. It is suggested that relatively 'Intact' ecological landscapes are managed for conservation, and that the 'Restore'/'Repair'/'Reinvent' methods are applied to degraded sites (Seabrook et al., 2011). Dramstad and Fjellstad (2011) also view landscapes as dynamic and continuously changing. The perspective presented by Dramstad and Fjellstad (2011) that the changes landscapes go through can be reversed is particularly relevant in the context of this thesis, regarding the degradation of habitat that has occurred in the Mackenzie Basin, as it suggests that the degraded areas still hold conservation value.

When discussing these degraded sites, Seabrook et al. (2011) state that there is a need for different modes of restoration other than attempting to return the ecosystem to its earlier condition. This is because of the level of change and fragmentation that has occurred in most landscapes, it is not realistic to attempt to achieve a pristine wilderness (Seabrook et al., 2011). Endeavouring to restore to the original aesthetic also removes any potential recognition of the postitve impacts and dependance on humans for management of the landscape. Passing off human managed landscapes as pristine wilderness can undermine the rarity and value of those landscapes that are as untouched as they can be in 21st century. As identified by Schama (1995), there are areas that appear natural

but are not always free of human influence. New Zealand has areas that appear natural but are managed, as explored below.

When dicussing restoration in the New Zealand context, which has large areas allocated to conservation, contrasted with areas of highly modified landscapes, Meurk and Swaffield (2000) identify a fourth landscape condition additional to Parks' three relating to structural integrity, this being the landscapes across New Zealand dominated by anthropogenic patterns and forces, the most obvious of which being the landscapes established by european colonisation, and progressively more modified since then. They identify this landscape as being relevant for the modern day application of restoration techniques across landscapes that are highly modified from their original state. The restoration would be applied in a way that, rather than obliterating the evidence of people, the restoration stays within the patterns of the cultural landscape. This relates to the position taken by Nassauer (1995) in the Identity section on Page 43, in that the gradual adaption of familiar landscapes is more valuable than the drastic rezoning of land or allocation of areas for conservation. This understanding of the relationship between the exsiting landscape and the actions that are taken or the restoration level applied will be used to inform the generation of projects in the Mackenzie, as there is an existing stigma surrounding what land can and can not be 'productive' or 'conservation' (Hutchings & Logan, 2018). The different levels of restroation and their assocaited landscape conditions as presented by McIntyre and Hobbs (1999); Meurk and Swaffield (2000); Park (1998); Seabrook et al. (2011) are collated in Figure 10.

The three main restoration types are broken down into 'Restore', 'Repair', or 'Reinvent' in the following sections.

Classification type	Author	State of landscape			
		Unmodified ⟷ Highly modified			
Landscape condition	Park 1998 + Swaffield and Muerk 2000	Pristine Structural integrity	Altered indigenous structural integrity	Transformed structural integrity	Cultural and productive landscapes
	McIntyre and Hobbs 1999	Intact	Variegated	Fragmented	Relic
Management technique	Seabrook 2011	Restore	Repair	Reinvent	
	McIntyre and Hobbs 1999	Maintain	Improve	Reconstruct	

Figure 10: Alignment of restoration and landscape condition

4.3.1 Restore

As shown above, 'Restore' is the restoration technique allocated by Seabrook et al. (2011) to landscapes that are of 'Intact' to 'Variegated' condition, maintaining the 'Pristine to Altered structural integrity' usually in areas where there are already conservation measures in place. These are sites where management of pests and threatening processes in support of species diversity will maintain and improve the sites ecological value. It is accepted that species compositions might change, but through the appropriate management of the site, it will remain a refuge for native species to persist (Seabrook et al., 2011). The restoration of landscapes should be undertaken alongside the tools presented in the conservation section, such the improvement of connectivity and ability for species to move in future climatic conditions.

When discussing the restoration of ecosystem services and habitats, Lawler (2009) lists restoring habitat and system dynamics as being a key means of addressing climate change. They reference Harris et al. (2006) in that this is a key action for increasing resilience. However, Lawler (2009) suggest a focus on restoring processes rather than historic conditions or species. This is so to preserve the ecosystem functioning, which in turn allows species to adapt to changing climatic conditions. The emphasis on restoring the functionality of the ecosystem rather than the value placed on its static "untouched" appearance relates to the area of theory involving ecological aesthetics, which suggests that landscapes need to communicate functionality rather than simply appear natural, especially can remove the role of humans in managing the landscape (Gobster, 1999; Meurk & Swaffield, 2000; Stephenson et al., 2010). Although 'Restore' has the lower level of intense human management, the following restoration types provide more opportunity to communicate human input and management.

4.3.2 Repair

McIntyre and Hobbs (1999) associate a management approach aiming to 'improve' with variegated or fragmented landscapes. The landscape condition that relates to this 'Repair' restoration technique is altered to transformed structural integrity (Meurk & Swaffield, 2000; Park, 1998). The 'Repair' restoration type is directed at landscapes that are moderately degraded, but the 'Repair' of these systems would result in improvement, but not necessarily restore them to 100% of their previous ecological value or appearance (Seabrook et al., 2011). However, the repaired (restored) state is of higher ecological value than the unmanaged situation, and these areas can increase the connectivity of other areas (Network of protected areas p.33). This is because although the repaired state may not be sufficient for a permanent population of certain species, it can be hospitable

enough to facilitate passage. The final restoration type will be the most challenging to provide areas for permanent populations and transient areas, as it is typically applied to highly degraded areas.

4.3.3 Reinvent

Reinvent applies to landscapes that are highly altered and it is unrealistic to expect restoration to return the landscape to the former ecological state. However the design of unique (novel) ecosystems, hold potential for increasing the ecological value of a site nonetheless (Seabrook et al., 2011). These are the landscapes identified by Meurk and Swaffield (2000) as cultural landscapes due to the highly managed and modified nature that expresses the cultural values of those who shaped the landscape.

These perspectives are valuable to this research as they identify that the current means of operating in the Mackenzie Basin is unsustainable. The current method is protecting biodiversity and ecological values in the district though the practice of setting aside and separating different land uses (Hutchings & Logan, 2018). This focus on large, detached areas, needs to change to a network that is adaptable to future conditions (Lawler, 2009; Opdam & Wascher, 2004; Richardson et al., 2015). These articles assist in identifying multiple different approaches to restoration and conservation, that can be incorporated into existing management, or applied to new schemes in the Mackenzie. The different types of restoration and biodiversity management presented in these articles is valuable information when analysing existing landscapes and when designing for future conditions. They present that although when a large area of land is set aside and is perceived as being the best way to manage land, it may not be the case and alternatives should be considered. The network approach presents restoration and conservation as a more accessible concept where smaller actions can be taken by individuals in everyday landscapes, which leads to the expression of those actions to others in the landscape and how they are understood. The different perceptions and preferences individuals or communities may hold regarding a landscape is an important part of how they then interact and value that same landscape.

4.4 Aesthetics

As presented in the following sections, the appearance of the landscape and the systems that have shaped that appearance are inseparable. This cause and effect relationship need to be communicated to those who experience the landscape. Although there has been a period where the function of the landscape was the key driver and the appearance either dismissed or an afterthought, landscape architecture is a “practice that strives for the creation of aesthetic values (alongside other values)” (Van Etteger et al., 2016, p. 81). This section discusses how visually

appealing, legible landscapes can prompt support for the functions within them. Followed by the importance of a clear representation of what is a healthy landscape is in the Ecological Aesthetics section. Ecological Aesthetics leads into an explanation of the different types of legibility in a landscape, which goes into further detail regarding the expression of landscape systems, people and the unique character of a landscape. These positions add value to this research as they identify the importance of communicating the value of the landscape and its systems. The communication of systems can add understanding which in turn adds value as individuals see the landscape change due to the actions of themselves and others. A key part of this research is generating concepts specific to the Mackenzie Basin, exploring how these systems can be communicated and placed in the landscape in a manner that increases the protection and investment that a landscape receives. This will be important in achieving the goals identified in the Mackenzie Agreement (UWSVF, 2013a).

This section links closely to the wider, social goals of the Mackenzie vision:

- The *recognition* of the Mackenzie as a unique and valuable landscape.
- New Zealand's *recognition* of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible *sense of shared responsibility* for restoring and maintaining its natural assets

  (Emphasis added) (UWSVF, 2013a, p. 4).

These goals are dependent on the recognition of the Mackenzie by the community and New Zealand, this recognition is dependent on understanding. The level of investment and the different perspectives applied to these landscapes by the community, relates to the appearance and understanding of this appearance. To the extent that the appearance of the landscape can affect those who interact with it.

Kaplan and Kaplan (2011) observe that potential of environments encouraging reasonableness and generosity. In that exposing individuals to the natural environment improves their mood and encourages them to be involved. In the Legibility section (p. 41), the effects of the understanding of an individual's actions and the actions of others is discussed.

The importance of introducing aesthetics as the 4th dimension of sustainability is advocated for by Meyer (2010). She credits the beauty of the design of Orongo Station as an essential component for sustaining the design and support from those who experience it. This is due to the visual appearance of a landscape being the first perception we understand a landscape with, experiencing more senses

with exposure over time (Gobster, 1999; Meyer, 2010). Orongo Station is a North-Island sheep station, whose international owners asked Nelson Byrd Woltz Landscape Architects to reimagine it (Byrd, 2013). It is a recovering biodiverse, experientially rich landscape. The drivers that informed the redesign of Orongo Station and the theoretical positioning of it are valuable perspectives in integrating conservation and production (Abbott, 2018; Byrd, 2013; *Orongo Station Conservation Master Plan*, 2010). Nelson Byrd Woltz aimed to "develop ecological conservation projects interwoven with agricultural uses to enhance biodiversity within the active agrarian landscape" (Meyer, 2010, p. 23).

The Mackenzie examples need to contradict the perspective that sustainable landscapes cannot be achieved without financial loss (Hutchings & Logan, 2018). Therefore, any influence from the success of Orongo Station would be implemented by individuals to the extent that they can manage at the scale of a 'fence, a bridge, a garden," and therefore collectively by the community at the scale of "an ecosystem" (Meyer, 2010, p. 23). By generating a series of concepts through this research that provide the human scale starting point, there are less restrictions on those who believe they can participate – they do not have to be philanthropists to assist in sustaining the land they care about (Abbott, 2018). The investment of changes in a landscape for the health of the ecosystem and no immediate fiscal benefit links back to the need for commodity *and* non-commodity outputs to be recognised as identified on page 30. As a part of communicating the actions of individuals who care for the landscape, there needs to be an understanding of what positive and healthy landscape change looks like, as examined in the following section.

4.4.1 Ecological Aesthetics

Meurk and Swaffield (2000) suggest that future landscapes should stimulate and inspire engagement, rather than prescribing actions to improve the sustainability of a landscape. Creating landscapes that express both New Zealand's unique biodiversity and cultural landscapes is intended to achieve this. Doing so in a way that does not force a set of formulaic features onto individuals, but rather presenting a range of inspiring options to work off. This is the approach which is intended to be taken in the creation of concepts for the Mackenzie Basin landscape and the vision identified in the Mackenzie Agreement (2013). They will not be presented as *the* solution – more a set of potential options or elements to choose and adapt. This allows for recognition of the individuals tastes and values, as well as expressing the differences between them.

Expressing individuals in the landscape to inspire others to actively participate, rather than separated human actions out and viewing the systems and pressures on the landscape as something

unrelated to their actions is advocated by Gobster (1999). This perspective is echoed by Stephenson et al. (2010), in that by viewing the landscape as something scenic or separate, it allows individuals to see themselves as the 'viewer' and to be passive, rather than acknowledging that they are in fact a participant and through recognising themselves as participants, also recognising that they are in fact part of a constant exchange. The need for the communication of landscape systems to the community to facilitate understanding of their role, and to link culture and ecology is articulated by Meurk and Swaffield (2000, p. 131) "The science of landscape ecology must be integrated with the art of landscape design and planning, in order to translate understanding and identity into action".

Regarding understanding and identity, Meurk and Swaffield (2000) also discuss the value of diversifying our focus, from pristine areas to those heavily impacted by humanity. Although New Zealand tends to focus on valuing the pristine areas, there is more potential to be found in creating a unique national identity in the landscapes that clearly show the impact of humanity. Currently the allocation of areas for restoration is to set them aside with the intention of restoring pristine natural integrity. However, these areas are also associated with appearing messy and unkept if the same patterns and species are present in areas other than reserves. The potential for public understanding through recognition of the intent of those in the landscape is discussed in later sections. Meurk and Swaffield (2000) suggest phasing the exotic species that make up the structural elements of the landscape out in favour of natives, or species that has higher ecological value. Keeping the patterns of the agricultural landscapes as productive landscapes 'should look' according to pastoral history and cues to care (Nassauer & Faust, 1995; Nassauer, 1995). Slowly introducing more elements to achieve a uniquely New Zealand way of operating, that supports our ecology and national identity /culture. This is aligned with the Mackenzie documentation that expresses the need for New Zealand's recognition of the Mackenzie as an iconic area, with a unique and valuable landscape (UWSVF, 2013a). The existing areas of 'pristine' ecology are still essential to a resilient population of native species, and can be sources of biodiversity, rather than refugee camps for those isolated in a sea of exotics and highly modified landscapes (Meurk & Swaffield, 2000).

Finally, Meurk and Swaffield (2000) suggest four main methods to achieve this: Firstly, natives as structural elements; second, areas of high intensity production that are interspersed with; third, mixed and native production; and fourth, areas which are in transition, acknowledging that landscapes are evolving. These provide guidelines that could be used for generating concepts for the Mackenzie Basin. These recommendations are an instance where the literature provides relatively specific recommendations. These methods are valuable due to being in the New Zealand ecological

context, as well as a scale that is legible to humans. This human scale or 'perceptible realm' is discussed below.

Gobster et al. (2007) compile their similar and differing perspectives regarding the ecology/aesthetics relationship, including analysis of the different interactions between ecology and aesthetics in the landscape. Key findings from the article are the identification of the 'perceptible realm'. This is the scale which humans experience and understand the landscape. Secondly, the actions and understanding that occur in the perceptible realm have flow on effects for the landscape composition, appearance, and ecology. Lastly, that the context for any interaction prompts different responses. They assert that there is a difference in the response to a landscape of 'scenic aesthetic' (conservation), compared to a landscape that expresses an aesthetic of care, attachment and the identity of the individuals within it (production). The perceptible realm will be the 'human scale' which the concepts for the Mackenzie are generated within for ease of communication with and applicability by the stakeholders to the wider community in the landscape. The different types and the importance of legibility are explained in the next section that goes into depth regarding the expression of individual and landscape systems.

4.5 Legibility

Legibility is defined as the "capacity of a project to be understood" by Julia Czerniak in the book 'Large Parks' (Corner & Czerniak, 2007, p. 215). This understanding of the wider 'project' or landscape is broken down into 'Intent', 'Identity', and 'Image'. All three need to be effectively expressed for the landscape to be understood by the public, and support of a landscape to continue. The process of achieving parks that the 'Intent', 'Identity', and 'Image' are legible extends to the design process, and expressing these to the public is the key design challenge (Corner & Czerniak, 2007). The importance of understanding the community for the design process follows through to the design process. While Corner & Czerniak (2007) are referring to the context of large parks, there is valuable insight to be found applying these to the Mackenzie context, especially when designing concepts to improve the sustainability.

The 'Intent', 'Identity', and 'Image' of the landscape were used to compartmentalise aspects of literature. The intent was interpreted as the evidence of people in the landscape working in the landscape. Often alongside one another consciously or subconsciously to achieve common goals. The identity of the landscape was the expression of the landscape systems, and how humans can affect these systems that are the distinguishing characteristics of the landscape. The image is reviewed as being the intent and identity of the landscape that is presented to those within and

outside of the landscape. The image includes both the visual appearance and the systems or goals that are prioritised in the marketing or presentation of the area to others. Alternatively, the image could be known as the landscape character. The theory is broken down into these three sections of: 'Intent', 'Identity', and 'Image' below.

4.5.1 Intent

Intent is defined as "the landscapes evolution and goals" by Corner and Czerniak (2007, p. 215). In this literature review it is reviewed with other material linking to the evidence of people and their actions in the landscape. 'Intent' directly links to the Mackenzie goal "New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets (UWSVF, 2013a, p. 4)"

Ingold (1993) discusses how the landscape is a 'taskscape' made of and interpreted by the actions of an individual and others. Two examples of this in Mackenzie Basin are the rocks stacked on river beds and along tramping tracks as trail markers to mark the route others have taken before, as well as the campsite on the shores of Lake Pukaki that has been "scarred" by vehicle movement, and the finger is being pointed in blame at the freedom camping visitors (Mitchell, 2016, May). In a landscape such as the Mackenzie, where the evidence of humans can be relatively subtle, the context of evidence of other people is important, and can be interpreted differently by different individuals.

Relating to the context of the evidence of others, Nassauer (1995) identifies the value of cues to care, which represent the time and value placed on a landscape through maintenance. Nassauer suggests that these are used to integrate accepted aspects of the landscape with unfamiliar elements that improve landscape, as also discussed by Meurk and Swaffield (2000) in the Ecological Aesthetics section (p. 39). These are important in a rural landscape as large areas of land may be the responsibility of few individuals. The importance of communicating and understanding the intent/cues to care/taskscape is echoed by Egoz et al. (2001) in their analysis of New Zealand's farmed landscapes, where they also discuss the different perspectives in New Zealand depending upon cultural background on top of understanding of the systems at work on a landscape. Another industry or ecosystem that is influenced by public perception of landscape health is forestry. Linné and Sellerberg (2018) discuss the different understandings of a forests appearance based on knowledge of the associated industry. The discuss how these values are based upon their interpretation of the work that is invested in maintaining the landscape in that manner. The New Zealand context of statutory decisions influencing how residents can modify their 'private property'

being largely dependent on how the change will effect transient viewers (Read, 2005). Although the landscape settings for these observations is different than that of the Mackenzie, the social aspects provide insight for those working a landscape that others perceive as scenic.

Fischer et al. (2007) quotes Aldo Leopold talking about the difference in perspectives surrounding man being a part of nature, compared with the conflicting impression that humanity is conqueror of nature. This expression of a relationship between those in the landscape and the land they are caring for is essential in recognising that the humanity, from the community to the transient or viewer has some impact on the landscape. Gobster (1999) looks at the appearance of a landscape being managed in order to disguise its use (forestry harvest patterns), while this is not the universal perspective through this review, it could be a tool used when considering current changes in the landscape that cause extreme change to the landscape character. The features that disrupt the landscape character or have negative connotations could be mediated by other elements that express positive, healthy landscape changes, as long as they are integrated, rather than traded. Ideally expressing these features in a way that expresses that those in the landscape care for (and recognise) the systems of the landscape, which is discussed below.

4.5.2 Identity

Corner and Czerniak (2007, p. 215) define identity as the distinguishing character and organisation of a landscape.

To clarify the two instances that character is used in the legibility section: Although the next section 'Image' is referred to as the landscape character, the image is the character as it is expressed to those whose are not residents of the landscape. For those within the landscape, the 'character' the site specificity that they experience through extended exposure – not the visual character that can easily be expressed by photography or video. So there are 2 differentiating points.

1. Identity = Character as experienced by the community *vs* Image = Character as seen by visitors or those who have never visited.

2. Identity = Human scale, individual locations *vs* Image = Landscape scale, accumulated impression of the region.

There are two main ideas examined in this section. The first is site specificity and the second the expression of landscape systems. Both add to (or arguably create) the identity of a landscape. Site specificity refers to the concepts presented in Site Matters: Design Concepts, Histories, and Strategies by Burns and Kahn (2005). Expression of landscape systems can be a component of site

specificity, but also is present in landscape ecology and other literature regarding the investment of society in the environment. Literature reviewed relating to site specificity and expression of landscape systems are presented below.

Elizabeth Meyer discusses the link between the systems on a site and design, with the former being inseparable from the latter "design as site interpretation, and site as program, not surface for program" (Burns & Kahn, 2005, p. 93). It is stated that landscapes need to be designed experiences as much as ecosystems, because the experiences are what humanity connects to the landscapes with, and therefore how connections and care for the landscape is formed. The interconnection of hydrology, ecology and human life is stated to represent the fact that nature is not separate but a part of our way of life. This integration of different functions is discussed in the Multifunctionality section on page: 28. This requirement for landscapes to be designed and managed to engage both experiential and ecological qualities is relevant for the generation of concepts in the Mackenzie. This is due to the tensions between the different priorities of stakeholders and how they engage with the landscape.

When discussing how landscapes 'should' look according to different perspectives, Nassauer (1995) also examines the integration of ecosystems and experience and way that ecology can be incorporated into landscapes. Nassauer suggests that by managing controversial sites in a way that is socially accepted by 'framing' areas of value with landscapes that are maintained in a manner perceived as being preferable or representative of stewardship/care. One technique identified in the literature is using design to bring landscape systems to the fore, as well as the integration of human infrastructure with these systems as being key for increasing understanding and investment (Meyer, 2008; Nassauer, 1995). As presented by Lovell and Johnston (2009a), the development of representative sites can be used to communicate ecological systems to the public in an environment where wouldn't otherwise be noticed. Representative sites can also be used to communicate the positive impact of management, as was discussed in the Ecological Aesthetics section on page 39.

Looking back to the setting of the landscape theory into the landscape Antrop (2006) questions how multifunctionality fits into other changes in the landscape, asking if the benefits of multifunctionality can be achieved in landscapes, without losing the identity of the landscape? If the systems that shaped the 'Identity' of the landscape are changed, then the authenticity of the landscape and the intention of restoration or management in future needs examination. As discussed in The Mackenzie Landscape section (p.2), the Mackenzie appears a certain way because human impacts have prevented successional processes (Swaffield & Hughey, 2001). This dependence upon human processes is discussed in the 'Image' section. The 'Identity' which the community wish to maintain

must be clarified, the Mackenzie Agreement (2013) is a step towards achieving this. This is because landscapes which are set aside with the intention of maintaining the same aesthetic they have currently, will change without management. The other element to consider is the subtle nature (until pivot irrigation) of production that occurred in the Mackenzie. Due to the scale and similarity of practices, there was a relatively uniform appearance to the landscape. Therefore, if the concepts generated by this research result in the appearance of the landscape changing, especially regarding the variety at the human scale, but greater values in other areas, what does that mean for the Mackenzie identity?

The identity of the population associated with the landscape required them to be exposed to and experience the landscape systems and species that make it up on a daily basis, as they go about their lives, this will promote the ownership and understanding of these values (Meurk & Swaffield, 2000; Stephenson et al., 2010). This is particularly relevant in New Zealand because of the dominance of exotic species in developed areas, where the majority of New Zealanders live (Clarkson & Kirby, 2016). There is under 10% remnant cover in cities, where individuals must travel to a national park or reserve to experience landscapes dominated by natives (Clarkson & Kirby, 2016). When individuals do experience areas outside of urban areas, they may rate landscapes as healthier than they are due to lack of recognition of weed species that are degrading the landscape (Hughey et al., 2008). This links to the understanding of a landscape and support for that appearance visitors have.

The identity of a landscape is closely related to the image it presents. Particularly an area so extreme as Mackenzie Basin. Presenting the identity of the landscape as the dry-land that it is, conflicts with any marketing of imagery showing lush green paddocks, or rainbow lupins, which are degrading the identity and systems of the Mackenzie Basin (Hutchings & Logan, 2018; UWSVF, 2013a).

4.5.3 Image

The image of the landscape is defined as its appearance, as well as its marketing strategies (Corner & Czerniak, 2007). The intent and identity of the landscape that is presented to those within and (largely) outside of the landscape. Both the visual appearance and the systems or goals that are prioritized in the marketing or presentation of the area to others: What the landscape is known for to those who live outside of it. This relates to the overarching Mackenzie goal that focuses on New Zealand's recognition of the Mackenzie as an iconic area. (UWSVF, 2013a, p. 4)

Dramstad and Fjellstad (2011) note that preserving landscapes that only appear a certain way due to human intervention is challenging because there may be of lack of understanding of the management and the economic reality of those landscapes. They also suggest that academics place

more value on some aspects – such as biodiversity and culture - of the landscape than the landowners or public. Due to this, placing emphasis on these values in the landscape through design can help communicate and express them to others. Largely those who are not permanent residents and therefore do not have the time

An example of a landscapes image is promoting 'The Mackenzie Country' as a brand. This 'Image' is the marketing of tourism and conservation in a production landscape (UWSVF, 2013b). The landscapes and processes would evolve if the manmade systems were removed for conservation or scenic purposes (Meurk et al., 2002). The tussock grasslands for which the area is known were largely forest and scrub prior to human impact (such as fires) (McGlone, 2001). The revegetation to this state is a potentially unforeseen consequence for the community when a site is 'protected'. The question subsequently arises as to what the appropriate action is: if a site is protected to prevent degradation or ecologically negative change, is active management for aesthetic results appropriate? What if the management detrimentally effects a natural process and visual change exhibited by the ecosystem recovering? The key variable would be the level of understanding that the community has regarding the change. If they are informed of the continued management to maintain an appearance, does the site lose the impression of 'naturalness'? In contrast, if the landscape changes visually from the appearance that was protected, and they are informed, will that prompt support for a healthier, albeit visually different landscape? As the visual change represents ecological health increasing, the understanding between different stakeholder groups as to what the visual change represents would be important. For this communication between different stakeholder groups to occur, there would need be open lines of communication between the different groups, as presented below.

In the context of consultation and interaction with one another and the landscape, Duff et al. (2009); Kaplan and Kaplan (2011) suggest that for stakeholders to engage, and any endeavours to have sustained support, stakeholders need trust and understanding between different parties. This is underpinned by the impression that they are being heard, are making a meaningful contribution, and that any information provided is done so by a neutral party who is providing unbiased information, and not advocating for either stakeholder group. Introducing multifunctionality allows for the integration of different stakeholder's interests, therefore reducing the conflict that arises for an 'either/or' situation.

Creating a landscape where the actions of other people and the interaction of humanity and ecology is legible, is valuable in the achievement of all the Mackenzie agreement goals but is essential to those relating to the community and perspective of the landscape.

The Mackenzie documentation identified a need for guidance for the stakeholders to in a way that enabled them to be partners in the improvement of the landscape (Hutchings & Logan, 2018). This position is supported by the Literature. However, both the literature and the Mackenzie agreement identify that there is a lack of actionable concepts. These concepts would provide a starting point for application of goals to the landscape – either to be adapted by individuals or for a conversation starter between different stakeholder groups to achieve the goals together. Therefore, in this research, the theoretical material that elaborates on the Mackenzie vision and the goals identified within it (Figure 11) will inform generation of concepts through Design Directed Research.

Literature reviewed	***Elements from the Mackenzie vision and goals***
Multifunctionality	Protect Water quality Maintain healthy vegetation cover, Manage animal pests and invasive weeds Mix of irrigated and dryland agriculture, Land actively managed for biodiversity and landscape purposes, with integration of these wherever practical, A balanced and prosperous local community, New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets.
Conservation	Protect Water quality, Maintain healthy vegetation cover, Manage animal pests and invasive weeds, The recognition of the Mackenzie as a unique and valuable landscape, Land actively managed for biodiversity and landscape purposes, with integration of these wherever practical, New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets,
Restoration	Protect Water quality, Maintain healthy vegetation cover, Manage animal pests and invasive weeds, Mix of irrigated and dryland agriculture, Land actively managed for biodiversity and landscape purposes, with integration of these wherever practical, New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets,
Aesthetics	The recognition of the Mackenzie as a unique and valuable landscape, A balanced and prosperous local community, New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets,
Legibility	Manage animal pests and invasive weeds, The recognition of the Mackenzie as a unique and valuable landscape, A balanced and prosperous local community,

Figure 11: Sections from the literature review aligned with the Mackenzie goals and vision that area of literature addresses

The design process used to generate future Mackenzie landscapes was informed by the theory in the second half of this literature review. The use of this literature in the creation of concepts to inform the achievement of the Mackenzie Agreement is facilitated using design directed research to apply the literature reviewed in the first half of this literature review to address the Mackenzie vision and goals (as seen in Figure 11). Several approaches to design directed research were reviewed and formatted to be used as a guide for this research. The theory and format are presented in the next section: Design Directed Research.

Chapter 5

Design Directed Research

As noted quoted at the beginning of the literature review, Landscape Architecture blends and utilises aspects of different professions and academic fields (Van Etteger et al., 2016). While the processes and definition of research may be well defined in these fields (such as the sciences), what defines research in Landscape Architecture is evolving. One of the areas that is the most controversial, as observed by Swaffield and Deming (2011) is 'design as research'. As Swaffield (2013, p. 1194) recounts, 'design' often refers to the "shape, configuration or appearance of an object, building, or landscape", but in this context 'design' is a process with a set of steps and stages. The steps and stages used to inform this research are outlined in the following sections and Figure 12.

In Deming (2011, p. 53) the purpose of design is described as seeking to 'change a present reality into a future, more desirable one.' With the designer taking on a 'creative, problem solving role', in contrast, research is to 'know what is hitherto unknown and be able to communicate it to others as a generally reliable or valid new thought about some problematic aspect of the world' (Deming, 2011). Therefore, the combination of these two would theoretically result in the identification of a more desirable future, communicated to others in a reliable or valid manner that addresses a problematic aspect of the world.

Swaffield (2013) Identify the value of design in combining 'general' science and 'specific' design to achieve the potential scenarios identified by Nassauer and Opdam (2008), who advocate for the possibility provided by the of design to generate and partially test scenarios.

Research in applied environmental disciplines such as landscape architecture is often, as in this study 'driven by a perception of a social or environmental need', rather than driven by an intellectual curiosity as it can be in other fields (Swaffield & Deming, 2011). In this case, as identified through the preceding chapters, the perceived social *and* environmental need is for clarification in how the Mackenzie Agreement can be achieved through the individuals in the landscape, set within the wider need of national recognition that landscapes can hold multiple values (conservation and production). The motivation of the research being set in a worldly context rather than within established processes and norms requires the shaping of the direction and methods which are appropriate for the need being examined (Swaffield & Deming, 2011).

Design directed research is the model used for this study to generate a 'library of ideas' in a structured manner for the achieving the Mackenzie vision, in inspire and increase the potential of landscapes and those within them. The stages of this review identify the general steps taken in the methods section and the theoretical backing behind them, as informed by the literature reviewed and presented below.

Four resources initially were condensed into a table that allowed for the comparison and identification of areas that differed or overlapped. Figure 12 can be seen below.

Abbott/Bowring Lab for DDR	Questioning		Collaborating	Designing	Grounding		Communicating
IDF Design Thinking	Empathize	Define		Ideate	Prototype	Test	
Blackburne MLA Method	Publication + Analysis	Literature Review =	Matrix	Concept generation	Site application	Critique & concept development	
Copley MLA Method	Context/ + Infrastructure	Literature review =	Matrix	Concept generation	Site application	Critique of first design stage	Generalizable concepts

Figure 12: Analysis of different methods consolidated into steps for this study

The four resources were two articles and two theses. The two articles were: A laboratory for design-directed research: Building design scholarship and academic possibility through designing by Abbott and Bowring (2017), and; Design Thinking: New Innovative Thinking for New Problems by Dam and Siang (2017). These were followed by the two Masters of Landscape Architecture theses. The first being: Landscape as tension: exploring the analytical and generative potential of a focus on tension in the landscape by Blackburne (2014), and, secondly; The role of landscape architecture in designing for urban transformations and adaption after disaster: a design-directed inquiry within the context of post-earthquake Christchurch by Copley (2014). Other material was included through the review and a revised table is presented at the end of the section in Figure 17.

The thesis by Blackburne (2014) is set in a landscape that is of similar social setting to the Mackenzie. Banks Peninsula on the east of the South Island of New Zealand, is a patch work of highly modified agricultural landscapes, less modified landscapes, and regenerating areas of native scrub/forest/tussock land. Blackburne's thesis looks at the value to be found in the areas of tension in the landscape. Specifically, the tension between the farmer and the walker in Banks Peninsula. There are parallels to the situation in Mackenzie where a lack of understanding or perceived respect between different parties in the landscape is the cause of tension, as is the discussion on what the landscape should be used for or appear as (Blackburne, 2014).

The second thesis, completed by Copley (2014), focuses on different setting, but utilises similar methods. The focus area is the residential red zone in Christchurch, New Zealand. The site of a series of destructive earthquakes in 2010 and 2011. The residential red zone is an area of land that previously was a residential area near the central city but has been cleared of the old buildings and now (2019) sits vacant. The disaster and the effects of the earthquake prompted Copley to examine the relationship between people and the infrastructure that they rely on, and how they can become more resilient. Both authors started with a general idea of the context and refined the site which was to be examined through the course of the research using various selection criteria. The two articles are referenced throughout the following sections. The first step as identified by an analysis of the different methods is questioning.

5.1 Questioning

Design theorist Charles Owen (2001) presents an alternative model for design rather than the commonly accepted "here is the problem, find the solution" model. This is a two-step process where, rather than starting with how to make a something, you spend time investigating what should be made, what the optimal solution is to the problem, before moving on to how to make it. This process is intended to allow all possibilities seen before progressing to the how (Owen, 2001).

One method of finding the what rather than the how is the first part of an article on design directed research by Abbott and Bowring (2017). They identify questioning as a tool in the design process to maintain the complexity that is present in many Landscape Architecture and/or design projects. As a part of this, they suggest that by focusing on the question rather than the "site" – at least for the generative stage – that there is greater potential for innovation. Nassauer and Opdam (2008) define innovation as turning knowledge into design, in their article investigating the potential that design affords for sustainable landscapes, when science and society both contribute.

Jonas (2001) goes one step further than the two step questioning of Owen (2001), in the presentation of a design model that features three phases of questioning. By inserting conditions/context for the design of the solution *after* the problem has been identified. Like Owen (2001) and Abbott and Bowring (2017), the process of designing the 'solution' is only started after examining what the solution should be, rather than the typical model which is the equivalent of the last stage identified as a "problem being 'thrown over the wall' ".

Figure 13: Three phases of questioning by Jonas, (2001, p. 13)

The Interaction Design Foundation (IDF) design process presented by Dam and Siang (2017), shares similar elements to that presented by Abbott and Bowring (2017), and the methods utilised in the Masters of Landscape Architecture (MLA) completed and presented in the theses of Copley (2014) and Blackburne (2014). The comparison of these four are presented in Figure 12: Analysis of different methods consolidated into steps for this study. The first two aspects of the IDF method are in this case, subsections of the wider "Questioning" stage and are outlined below. Through the combination of the information that Blackburne (2014) and Copley (2014) reviewed through the first two stages of their theses, they gained an understanding of the context for their work (Empathised) and were able to refine the areas that they needed to work on (what to make, and defining the problem). This allowed to produce a matrix of values that accurately represented the information they had unearthed, and therefore could be used in the next stages of the process.

5.1.1 Empathise

The IDF Design Thinking article states that the essential first stage is understanding the context for the design. In particular an empathetic understanding of the users of the potential design, or the stakeholders in the current situation. The solution for understanding the users would normally be some sort of user research (Dam & Siang, 2017). In the case of Blackburne (2014), it was publication analysis to understand the different tensions present. In this thesis the resources provided by the Mackenzie Agreement (UWSVF, 2013a) and the Henley Hutchings "Opportunities for Agency Alignment" (Hutchings & Logan, 2018) provide a comprehensive representation of those in the

landscape, and the analysis of these documents will be used to understand the perspectives of those in the landscape.

5.1.2 Define

As part two of the IDF process, the information gathered in the 'Empathize' stage is distilled into the core problems (Dam & Siang, 2017). This process is intended to bring clarity as to the direction which the design process will take from this point onwards. The process of defining the research problem and focus is also informed by the existing literature and other material surrounding the subject. As part two of the questioning section, where the problem is being identified and articulated, the existing literature and theory surrounding it can be utilised to guide and provide clarity as to where there are gaps in knowledge, and what some existing approaches to the problem identified are. This clarity is achieved through the Literature Review stage in the theses completed by both Copley (2014), and Blackburne (2014), in combination with the understanding of the context gained from the first stage. The combination of these two stages results in the defining of the research questions for both, and serves to inform the creation of a matrix (Jonas, 2001) to be used in the 'Ideate' stage.

5.2 Collaborating

Once an understanding of the context and the problem has been achieved, Abbott and Bowring (2017) identify the value in collaboration with other disciplines and other people. The opportunities afforded by looking beyond the scope of one profession allows for the consideration of more variables and therefore a wider scope of ideas in the 'Ideate' stage. The collaboration of different fields and information is a part of bringing different aspects together to deliver value, creating possibility (Swaffield, 2013).

Duff et al. (2009) echoes this view in stating that through experience in savannahs in north Australia that collaborative projects were more effective in creating successful relationships and landscapes than integrative projects, where only at the end, do all participants interact. The stakeholders collaborate to achieve defined criteria, to achieve a sustainable landscape. The perspectives being combined at the beginning occurs in this case through the use of the Mackenzie Agreement and Henley Hutching's report (Hutchings & Logan, 2018; UWSVF, 2013a). The Mackenzie vision is an example of different groups "reaching a consensus on an overarching goal or purpose" for transdisciplinary research, as is advocated for by Tress et al. (2001, p. 140).

An example of 'Collaboration' in the theses is the use of variables from outside Landscape Architecture theory in order to enrich the generative potential of a matrix has been used by both

Copley (2014) and Blackburne (2014). Copley (2014) utilised Infrastructure design and resilience, and Blackburne (2014) used Lincoln University courses to represent the values that were found through the publication analysis. Their matrix formats are shown below in Figure 14, Figure 15, and Figure 16.

Copley summarised theory directly into a matrix over two iterations which refined and reduced the number of values and categories. This was necessary due to the complexity of utilising multiple categories that were all viewed to be valuable generatively. After the creation of the first matrix, there was recognised to be significant overlap in the 2nd (infrastructure toolkit) and 4th (resilience strategies) categories, and the 3rd (Corner and Meyer theory) category was too complex. Therefore the 2nd and 4th categories were synthesised and the 3rd simplified down to a useable (appropriate for the time and resources available in a one-year MLA) format. The two categories of Blackburne's matrix were combined in a grid structure that allowed for the intersection of one value with another value from the opposing axis, and these combinations were used as the basis for concept generation.

Figure 14: The matrix format utilized by Blackburne (Blackburne, 2014, p. 61)

Figure 15: The first iteration of the Matrix utilized by Copley. This format proved too complex (Copley, 2014, p. 42).

Figure 16: The second iteration of the matrix utilized by Copley. Note the reduction in variables, and therefore complexity (Copley, 2014, p. 45).

5.3 Designing

Abbott and Bowring (2017) present questioning and collaboration as means to increase the value to be gained from design directed research. The process of design itself employs a number of methods, from generative tools such as scenarios and design to analytical processes like synthesis, diagramming, and critique (Abbott & Bowring, 2017; Carter, 2004).

The matrix method in 'Collaborating' (p. 53) is identified as being a way to bring together elements which would have otherwise not been considered together. The production of many concepts using a matrix is able to be further tested by using the 'Quattro Stagioni'. 'Quattro Stagioni' is a tool which can be used at different stages of the process (Jonas, 2001) to test if all variables have been considered, or to change the weighting of certain values in a concept in order to generate more iterations or fill gaps in the breadth of ideas.

Quattro Stagioni in the context of design is use of 'two variables with highest impact and highest uncertainty' (Jonas, 2001, p. 15) along two axis to create a quadrant, with the extremes of each variable at opposing ends. Using the axis as a continuum of the values allows for the placing of

concepts based on their values (analysis), and to generate more concepts through relocating them along the axis.

5.3.1 Ideate

The ideate stage of the IDF process fits within the designing step identified by Abbott and Bowring (2017). It is the point where the information collected in the first half is realised into the first stage of concepts. It is also the crossing point, where the 'how' begins being investigated, having gained an understanding of 'what' needed to be designed through the emphasise and define stages. (Abbott & Bowring, 2017; Dam & Siang, 2017)

The ideate stage is about finding innovative solutions for the problem which you have identified (Dam & Siang, 2017). In the case of this thesis, the use of a matrix as starting points for ideation will be used. Looking at the combination of variables to imagine a wide range of concepts using variables that otherwise may not have been considered compatible or as being applicable in finding the solution (Jonas, 2001).

Both Copley (2014) and Blackburne (2014) had an ideation stage before applying the concepts to a specific site, rather than designing for a general situation or context, as was done in the first round of conceptualising. Blackburne coded and presented the matrix combinations that were the base for each concept, then analysed the select few to apply to the site for further designing/critique. We do not see the exact combinations which Copley utilised to generate the concepts that are then applied to site. The role of the site is further explained below.

5.4 Grounding

'Grounding' is the step where, in contrast to the 'Questioning' stage, where the site was removed, the site is now returned as a key component of the design process. This is because although there may be common elements or themes between designs, the project and where/when it is set, and how the elements are applied is specific (Abbott & Bowring, 2017).The importance of grounding is presented as being a tool to bring sustainability research away from theory and methods, and into real situations and places, to then be developed and tested (Meyer, 2010).

5.4.1 Prototype

In order to develop and test, the prototype stage of the method presented by Dam and Siang (2017) suggests building an inexpensive scale model, or version of the concept. In Landscape Architecture that is less straight forward than in fields such as product design due to the scale/spatiality of

projects. Therefore, in this case 'prototype' is interpreted as being the refining and application of a concept to site. This serves a similar purpose as is intended by the scale model as it is a time and resource efficient way to further examine the strengths and weaknesses of a design. The designs that are clarified at this stage tend to be of a human scale, as is appropriate for preparing them for 'testing' on an individual site. As seen in the methods chart, this aspect is common between the two MLAs, as they apply the first stage of concepts to a site to further develop them, and to critique their effectiveness (Blackburne, 2014; Copley, 2014).

5.4.2 Test

Which leads to the 'Test' stage, where the most valuable concepts that survived the selection process are critiqued and applied to a range of conditions or eventualities (Dam & Siang, 2017). The process of grounding the concepts is to test the effectiveness of concepts on a specific site (under certain conditions), and their applicability across a range of sites.

5.5 Communicating

The way in which Landscape Architecture communicates its findings to the stakeholders, other disciplines, or within the discipline, is part of what makes design so valuable as a process for research (Abbott & Bowring, 2017). The presentation of findings in a manner that can be understood and utilised by individuals from a range of backgrounds is of great value in this research and wider research, due to wide range of stakeholders in Mackenzie, and is advocated for by Tress et al. (2001). It is the final stage of most projects, including the masters studies of Copley (2014) and Blackburne (2014). Both analysed and presented the concepts and their effectiveness. Blackburne (2014) observed that there were widely applicable concepts but focused instead on the opportunities afforded by tension in landscapes. Copley (2014) however, explicitly presented a set of broad concepts that had proven valuable to the increase of resilience in communities. This refinement into generalisable concepts will be the focus of final communication that can be applied to a range of sites to meet the Mackenzie Agreement through stakeholder involvement.

Finally, the design process presented here, particularly IDF model, can cause the designer to have to take multiple steps backward with certain concepts or stages. It is not the linear process as charted on the table above. There are overlaps and circuits back in order the rigorously examine the content of the research. That is not to say in will be repetitive, as each time a concept moves forward through the process, it evolves. Therefore the concept that moves back to the 'Ideate' stage from the 'Prototype' or 'Test' stage, will not be the same as the previous iteration (Dam & Siang, 2017).

Abbott/Bowring Lab for DDR	Questioning		Collaborating	Designing	Grounding		Communicating
IDF Design Thinking	Empathize	Define		Ideate	Prototype	Test	
Blackburne MLA Method	Publication + Analysis	Literature Review =	Matrix	Concept generation	Site application	Critique & concept development	
Copley MLA Method	Context/ + Infrastructure	Literature review =	Matrix	Concept generation	Site application	Critique of first design stage	Generalizable concepts
Wolfgang Jonas Scenario design	Analysis – What is the problem?		Projection – Scenarios/Possible futures				
				Synthesis – What do we need for that?			
Charles Owen	What to design?		How to design?				

Figure 17: Revised methods analysis table, including material from Jonas and Owen

Additionally, given the number of times that (Jonas, 2001), and Owen (2001) were referenced in this process, an additional methods table was created. With their overarching ideas included.

5.6 Conclusion

The way the literature reviewed in this section is used through this thesis is outlined in the following Methods. The DDR material is overarching, guiding the designer's actions, compared with the landscape theory, which informs the concepts in meeting the Mackenzie goals through the matrix and analysis of the concepts compared to the theory. As observed by Abbott and Bowring (2017) and (Swaffield, 2013), design is valuable in the building of possibility, and widening of the imaginative scope, rather than selecting 'the answer', particularly when dealing with complex situations such as the Mackenzie.

Chapter 6

Methods

The following section describes how the Design Directed Research material reviewed in Literature Review guided the generation of concepts to achieve the Mackenzie vision. Firstly, the Mackenzie documentation was reviewed to provide an understanding of the perspectives of those in the landscape, to empathise. Secondly, a literature review was undertaken to identify how the literature could guide the achievement of the Mackenzie goal identified in the first step. Thirdly, the collaborative use of Mackenzie goals and the literature formed a matrix to guide the structured generation of concepts. Fourth, the ideation stage was the first stage of the generation of the concepts for the Mackenzie vision. In the fifth stage, the concepts generated in the ideation stage were refined into prototype groups that shared common values and applicability. Those prototype groups were then applied to different landscape conditions to test their applicability across different landscapes. This sixth testing stage was to assess if the landscape condition determined the applicability of any concepts. Finally, the concepts and groups were communicated through this thesis and the associated appendix.

6.1 Mackenzie Reports

Design Thinking: New Innovative Thinking for New Problems (2017) states that the essential first stage is understanding the context, to inform the design response. The empathise stage is intended to gain an empathetic understanding of the users of the potential design, or the stakeholders in the current situation. Ensuring that the design is not driven by the designer's preconceptions, but in response to the stakeholders and context.

The decision to undertake this research was driven by an interest in the issues in the Mackenzie through personal experience and previous projects. It was understood that the issues stemmed from landscape conflicts between primary production and conservation. The first step was to understand the Mackenzie issues in more detail, to empathise with those in the landscape (Dam & Siang, 2017). The Mackenzie Agreement (2013) and the Opportunities for Agency Alignment (2018) documentation were reviewed to form the drivers for this thesis and understand the perspectives of those in the landscapes. Empathise is the first of the two components of 'Questioning' as reviewed on page 52 (Copley, Bowring, & Abbott, 2015; Dam & Siang, 2017).

The second step was to *define* the focus and question of this research (Dam & Siang, 2017). Stage 2 was a review of literature relating to the goals and drivers identified through the consultation of the public in the Mackenzie documentation. The Mackenzie agreement and vision to guide the selection of literature. See Figure 11 for areas of theory relating to the Mackenzie context presented.

6.2 Literature review

As part two of the process, the information gathered in the Empathise stage is distilled into the core problems. This process is intended to bring clarity as to the direction which the design process will take from this point onwards. The process of defining the research problem and focus is also informed by the existing literature surrounding the subject identified by the empathise stage. As part two of the questioning section, where the problem is being identified and articulated, the existing literature and theory surrounding it can be utilised to guide and provide clarity as to where there are gaps in knowledge, and what some existing solutions for the problem identified are. The literature reviewed was used to guide the generation of concepts once combined into the Matrix.

There were 2 different scales within the literature and Mackenzie goals from the Mackenzie Agreement and Opportunities for Alignment documentation (p. 6) (Hutchings & Logan, 2018; UWSVF, 2013a). These are presented below in Figure 18: Different scales of the Mackenzie drivers and the literature reviewed. As can be seen by comparing this with Figure 18, there are areas of literature that are applied at a different scale as a driver, but are utilised to achieve that driver nonetheless. Such as 'Multifunctionality' and 'Protect water quality' (overarching literature and specific driver) or 'Restoration' and 'New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets." (specific literature and overarching driver). These are aligned in Figure 11. This is due to the more specific Mackenzie goals being set within the overarching drivers and the overarching literature includes elements specified in the specific literature. The qualities of the overarching material arrange and combine these elements according to the wider structure.

	Mackenzie	***Literature***
Specific	Protect Water quality,	Conservation, Restoration
	Maintain healthy vegetation cover,	
	Manage animal pests and invasive weeds,	
	Mix of irrigated and dryland agriculture.	
Overarching	The recognition of the Mackenzie as a unique and valuable landscape.	Multifunctionality, Aesthetics, Legibility

	Land actively managed for biodiversity and landscape purposes, with integration of these wherever practical,	
	A balanced and prosperous local community;	
	New Zealand's recognition of the Mackenzie Country as an iconic area, accompanied by an enhanced and tangible sense of shared responsibility for restoring and maintaining its natural assets.	

Figure 18: Different scales of the Mackenzie drivers and the literature reviewed

The complexity present in the Mackenzie landscape needed to be translated into concepts that represented what the community had identified they wanted to achieve combined with what the literature advocated, rather than an entirely subjective response by one individual required the conscious following of a Design Directed Research process.

It was recognised that combination of the Mackenzie vision with the positions advocated in the literature had the potential to be highly complex. Therefore, in order to increase the consistency, truth value, and organisation (Deming, 2011) of the process, a review of the methods to be utilised was undertaken. Resulting is a clarification and structure of the methods that would be utilised to generate a structured mix of concepts. The derivation of this process is defined in the following section.

6.3 Design Directed Research methods literature review

When the initial review of the Mackenzie and the literature indicated a need for designed solutions to progress overarching recommendations, the process which this could occur needed defining due to its potential complexity. Due to the varied perspectives on Design Directed Research, it was necessary to review articles relating to how this research would be completed as well as what it would focus on. A range of material was reviewed, from articles, books, a website and two previous theses. This review was presented in the previous chapter: Design Directed Research (Page: 49). The exemplar theses of Blackburne (2014); Copley (2014), provided an solution, which was the use of a matrix to systematically generate concepts. The structure of the matrix required multiple iterations in order to allow for both the scope and representativeness required in this context, this process is detailed below.

6.4 Finding the matrix

In the case of this thesis, the use of a matrix as a starting point for ideation was utilised. This was intended to prompt an examination of the combination of variables to imagine a wide range of concepts using variables that otherwise may not have been considered as being useful in finding the solution (Jonas, 2001). The first version of the matrix is presented below in Figure 19.

1. Mackenzie Goals	2. Sustainable landscapes	3. Landscape theory
protect water quality maintain a healthy vegetation cover on the land. manage animal pest and weed invasion manage windblown soil loss. irrigated and dryland agriculture, tourism related development, land actively managed for biodiversity and landscape purposes. The integration of these land uses and types balanced and prosperous local community and New Zealand's recognition of the Mackenzie Country as an iconic area. enhanced and tangible sense of shared responsibility	Multifunctionality Restoration Network of protected areas (stabilising key areas) Heterogeneity Permeability	Communication of human actions Communication of landscape systems

Figure 19: The first iteration of the matrix. This version would have resulted in 110 concepts

As original version was going to result in a high number of combinations, in using methods similar to Copley (2014) this was refined to a version that would result in 24 combinations.

1. Mackenzie Goals	2. Restoration	3. Legibility
Protect Water quality, Maintain healthy vegetation cover,	Restore Repair Reinvent	Implicit Explicit

Manage animal pests and invasive weeds, Mix of irrigated and dryland agriculture.		

Figure 20: The version of the matrix used in this study

The first matrix included virtually all of the Mackenzie drivers and literature sections. As identified in Figure 11 and Figure 18, there are overarching areas of theory that apply across all of the Mackenzie goals, and there are overarching areas of the Mackenzie documentation that require specific aspects of the literature. 'Manage windblown soil loss' was removed due to addressing the issues associated with it through the 'Maintain healthy vegetation cover' and 'Manage animal pest and weed invasion'. 'Tourism related development' was removed due to the focus of this thesis focusing on the potential 'productive' landscapes of the Mackenzie. The dominant conflicting land use in the Mackenzie, which other industries occur on/within is the interface between conservation and production. The pressure from the tourism industry is significant (Hutchings & Logan, 2018), and due to the complexity, is an opportunity for additional research.

The original matrix also did not allow for expression of the stakeholders' preferences or values, there were no guiding variables by which to apply to different situations. As described by (Meurk & Swaffield, 2000), the results of this process are intended to inspire, rather than prescribe. A perceived restriction on landowners in the Mackenzie is that the landscape condition restricts the possibilities of different land uses. The majority of land use conflict are regarding the degree of landscape modification and the associated impact on the biodiversity (Hutchings & Logan, 2018).

Therefore, the second column is the three different types of restoration that were reviewed in the Restoration section (p. 34). The corresponding landscape condition that was presented by various authors and in Figure 10 are not included. The exclusion of the landscape condition is to explore the possibility of restoration aligned with the Mackenzie goals regardless of the existing condition. The landscape conditions are reintroduced after the first stage of concept generation. Restoration rather than conservation was chosen due to the ability for the management types to represent the 'intentions' of a landscape and those within it, rather than being dictated by the existing conditions. Additionally, the conservation theory is underlying guide for restoration actions, so it is included through integration rather than as a matrix variable.

The third column relates to the legibility of the landscape, both to the community and visitors. This column is a combination of both the Aesthetics (p. 37) and Legibility (p. 41) sections of the Literature

Review. In keeping with the 'inspire rather than prescribe' method suggested by Meurk and Swaffield (2000), these legibility values were not split into their functions ('Identity', 'Intent', 'Image'). Instead, the way the concept generated by the Mackenzie goal and restoration type was expressed within the landscape. The two values were implicit and explicit. Implicit shares values with the concept of slow landscapes presented by Meyer (2010). Slow landscapes involve the expression and evolution of natural systems and human's relationship with them through exposure over time. The concepts express the care and management of the landscape, but in a subtle manner that is communicated and understood in a relatively 'natural' manner. This shares elements with comfortable, picturesque landscape patterns, but does not attempt to disguise the care applied. The alternative, explicit legibility, expresses the actions of humans, through the form or progressive application of the concept. These evolved from the two options of either expressing landscape systems or the impacts of humans due to the requirements that both are expressed for the landscape to be fully legible. The selection of literature that form this matrix was driven by the Mackenzie vision, which included biophysical and social elements. The application of a biophysical (restoration) perspective and a social perspective (legibility) to the concept generation relating to any goal from the Mackenzie Agreement aims to achieve all aspects of the landscape being considered. As identified by Fischer et al. (2007) and O'farrell and Anderson (2010), biodiversity and ecosystem issues are interconnected with the social and economic realms. As advocated by Antrop (2006) and echoed by Naveh (2001) a holistic approach is essential to dealing with the complexity of the landscape. This is because the process of compartmentalisation loses value, as the systems in the landscape are nested and interconnected. The inclusion of both biophysical and social in the matrix represents the combination of both values in the Mackenzie vision. The process of considering both the restoration and the legibility values for all the Mackenzie goals in the matrix aims to increase the likelihood of a thorough exploration of all possibilities, each with a biophysical and social/aesthetic value.

One combination of each of these variables (Mackenzie goal + restoration type + legibility type) was generated. These resulting concepts were then grouped according to similar structures, locations, or values. These groups were applied to different landscape conditions. This process by which this occurred is explained in the following section: Concept generation.

6.5 Concept generation

The format of the generative matrix to be used in this research was similar to Copley (2014). Copley's method utilized the combination of infrastructure system types (the equivalent of the Mackenzie goals section), and infrastructure design toolkit and resilience strategies derived from

one type of theory (the equivalent of the restoration section), with the perspectives on the relationship to spatial from of two different theorists (the equivalent of legibility section).

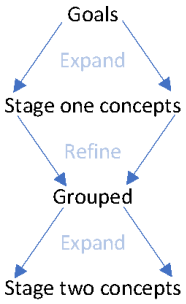

Figure 21: Expand/Refine process for concept generation

The coding method for these concepts is similar to Blackburne (2014). By using this coding, the combination of variables is traceable and able to show that the scope of concepts utilised all variables. This coding will apply a number to each of the goals (1, 2, 3, 4), restoration types (1, 2, 3), and legibility types (1, 2). Therefore, a concept that was generated through the combination of the Mackenzie goal of 'Maintain healthy vegetation cover', with the 'Reinvent' restoration type, and 'Implicit' legibility would be coded 2.3.1.

As according to the methods reviewed in the literature, there are multiple phases of a design and research process. This was true for this thesis. The concepts experienced multiple iterations. Expanding the breath of ideas, and then refining and synthesising them.

The first stage of this was to generate a concept for each of the matrix combinations. This process of expanding the number of iterations, followed by refining the concepts into groups, then expanding the groups to different landscape conditions is presented in Figure 21: Expand/Refine process for concept generation.

The first stage of concepts was found by generating a concept for each of the matrix combinations. These 24 concepts can all be found in Appendix C: Concepts derived from 24 matrix combinations.

Stage one				Stage two		
Mackenzie Goals +	Restoration +	Legibility =			Groups +	Landscape condition
Protect Water quality, Maintain healthy vegetation cover, Manage animal pests and invasive weeds, Mix of irrigated and dryland agriculture.	Restore Repair Reinvent	Implicit Explicit	24 Concepts	Synthesis	Layering up topography Patches and connections Cycling production Staged revegetation Layered riparian Pest management from landmark	Intact Variegated Fragmented Relic

Figure 22: Full matrix and process

These were then analysed and grouped (synthesised) into their common themes, forms or context. This resulted in six groups. Figure 22 shows the two stages of this process and all the variables utilised in the structured generation and refining of concepts. The combination of multiple concepts was intended to the combination of multiple goals into concepts that could achieve several aspects of the Mackenzie Agreement through their application. This was the equivalent of the prototype step, and the first part of 'grounding' the concepts as described in the Grounding section on page 56.

After ideation, the selection of a site is needed to further test and place the value of the concepts. The process of designing or analysing concepts in relation to a real world context opens the door to more insightful and nuanced results (Burns & Kahn, 2005). In this research the concept of 'site' evolved through the process. Because although the concepts are to be of a human scale, they are to be applicable to the region, rather than a location with set perimeters such as a stations' boundaries. Therefore, 'site' is understood as a landscape condition within the Mackenzie context.

Where the Blackburne (2014); Copley et al. (2015) used specific locations at this stage to 'test' their concepts for generalisation and potential applicability, this research applied the groups to the four

different landscape conditions identified by McIntyre and Hobbs (1999), resulting in 24 iterations of the different groups, four landscape conditions for each of the six groups. The application to different landscape conditions was to provide exemplars for stakeholders within the variety of landscape conditions that can be found in the Mackenzie.

One of the aspects of this research was to investigate the perception that the landscape condition defines the agricultural or conservation potential of a site. As such, these combined concepts were applied to the range of landscape conditions. In the Mackenzie Basin and New Zealand, landscape condition 'Intact' is rare through the extensive pastoral history (Meurk & Swaffield, 2000; Schama, 1995), and theoretically has the highest probability of occurring within a 'conservation' landscape. If the intact condition correlates with conservation landscapes, such as a reserve, then 'Relic' landscape condition is the most likely in highly modified 'production' landscapes, such as an area of top-dressed and/or irrigated pasture.

The grouping of concepts that have been derived from different drivers but are all a part of the overall vision was used to investigate how interrelated the landscape systems and land uses can be. The goals that were met by each of the groups were then analysed according to a 3-star system. 3 stars = fully achieved the goal, 1 star = may have benefited the goal, but only due to common elements with other concepts.

The hierarchy of these groups was then analysed and arranged according to scale and sequence they would be applied to the landscape. Including the relationship between the different groups. These can be seen in Figure 25: Hierarchy and scale between different groups and Figure 26: Relationships between the different groups.

6.6 Conclusion

The methods undertaken for this thesis were a response to the context and the theory. Integrating the specific requirements of the Mackenzie Basin, with the general structure and systems of DDR. Firstly, the Mackenzie documentation was reviewed to empathise with those in the landscape and the complex issues of the Mackenzie Basin. The Mackenzie agreement, personal experiences and the previous projects informed the selection of literature for the review. From the literature review, the variables were derived that would be used in the matrix for generating concepts, as the literature review also identified a need for actionable concepts at the human scale. This matrix was refined to reach a format that represented the intent of this research and provided appropriate generative potential for the resources available. 24 combinations of the matrix were systematically generated. These were then synthesised to form six groups. These six groups were then applied to four different

landscape conditions, resulting in 24 iterations. This process also identified how the groups would interact, what sequence they occurred in their application to the landscapes. Finally, these results were presented through this thesis and the associated plates (Appendix C: Concepts derived from 24 matrix combinations) intended to be an accessible format for stakeholders in the Mackenzie. These results are described in more detail in the following chapter.

Chapter 7

Results

The main aim of this research was to investigate potential compelling multifunctional landscape visions for the Mackenzie Basin. Through the process of investigating this, the conflict between the potential for multifunctional landscapes and the current New Zealand dichotomy between conservation and production was questioned. In response, a secondary question was asked of this research: Beyond achieving the Mackenzie vision, can the results represent a potential future for wider New Zealand? One where there are levels of layered conservation and production values through all landscapes? Finally, the last question arose from a point in the Opportunities for Agency Alignment consultation document, which suggested that farmers feel 'punished' when their land features valuable ecology (Hutchings & Logan, 2018, p. 25). This negatively affects the possibilities for integration, as they then do not want to be managing those areas. The perception that different landscape conditions have assigned functions allocates who will manage that landscape, potentially setting stakeholder groups against one another as a consequence. During the creation of the matrix and literature review, three different types of restoration were introduced, to apply a layer of conservation to the concepts, set in the production dominated context of the Mackenzie Basin. Although these restoration values are presented alongside landscape conditions in the literature, this research investigated the potential of removing this formulaic approach. What are the possibilities afforded by removing the landscape condition as the dictator of function? The intention being to examine the possibilities of modification in intact landscapes that maintains ecological value, and restoration in landscapes where there is almost nothing remaining to 'restore', with all the intermediate combinations. If the existing landscape condition was not the dictator of function, it would open up the possibilities of 'whose' landscape an area or condition was. Ideally creating an environment where stakeholders are not set against one another, but rather can work together on increasing the multifunctionality of the landscape.

This chapter presents the results of the different combination of values derived from the Mackenzie context, and academic literature through use of a matrix and principles of Design Directed Research (DDR). The process used to derive these concepts is outlined in the Methods (p. 59), and the literature that has informed their generation is found in Literature Review (p. 27). The results are laid out in three phases through this chapter. The first section presents the results relating to future Mackenzie landscapes, through the combination of each of the 24 matrix possibilities. These concepts were then grouped into six groups as outlined in Methods. The groups are summarised in

this section, presented with the landscape that they most naturally applied. The relationships between the grouped concepts are laid out. Following this, in the section are the results relating to the potential layering of conservation and production in New Zealand. In the third and final section, the results of generating concepts without the consideration of the existing landscape and applying the groups to different landscape conditions are presented.

7.1 The context for the results.

The following section briefly outlines the process taken to these results. This is in order to understand how the different components interacted through the process, and the results relate to one another.

<table>
<tr><th>Stage of process</th><th colspan="3">Results</th><th>Question identified or investigated</th></tr>
<tr><td>Mackenzie documentation</td><td>Context generated question 1</td><td rowspan="2">Combination of context and literature generated question 2</td><td rowspan="3">Combination of context and literature and methods generated question 3</td><td>Identification of question 1:</td></tr>
<tr><td>Literature review</td><td></td><td>Identification of question 2:</td></tr>
<tr><td>Matrix identified</td><td></td><td></td><td>Identification of question 3:</td></tr>
<tr><td>24 concepts</td><td colspan="3">Analysed for conservation/restoration balance by concept</td><td>Investigation of question 2</td></tr>
<tr><td>Analysed and synthesised into:</td><td colspan="3"></td><td>Investigation of question 1 (part 1)</td></tr>
<tr><td>6 groups</td><td colspan="3"></td><td></td></tr>
<tr><td>applied to 4 diff L/S conditions</td><td colspan="3">What was the role of landscape condition</td><td>Investigation of question 3</td></tr>
<tr><td>24 iterations, which were analysed according to their interactions and relationships</td><td colspan="3">Do these results provide future Mackenzie landscapes?</td><td>Investigation of question 1 (part 2)</td></tr>
</table>

Figure 23: Identification and investigation of research questions, alongside process and results

The process taken to reach the results presented in this chapter included the use of material from the community, in the form of the Mackenzie Agreement (2013a) and Opportunities for Agency Alignment Report (2018) combined with academic theory. The first component was derived from the Mackenzie Agreement (2013a), which outlined the communities vision for the Mackenzie District. Four goals derived from this vision have been used to generate concepts for achieving the vision.

A matrix was used to systematically combine theory with the Mackenzie goals to generate a depth and breadth of concepts to refine and present as options for the Mackenzie vision. There were three tiers of the matrix, and concepts were generated by combining one option from each tier. In the first tier, there was the four goals identified by the Mackenzie community (2018; 2013a): protect water quality, maintain healthy vegetation cover, manage animal pests and weed invasion, and the combination of irrigated and dryland agriculture. These were then combined with the three different approaches to restoration identified by Seabrook et al. (2011): 'Restore', 'Repair', and 'Reinvent' from the second tier. Within the Mackenzie Agreement vision, there are sociocultural goals that relate to the values placed on the landscape, and the way it is understood by visitors and residents. Landscape Architecture in this context aims to contribute in achieving these sociocultural elements to increase investment through understanding, facilitated by appearance, through the implementation of designed concepts. Therefore, the last tier of the matrix is the level to which the actions of people and the biophysical systems within the landscape can be read and understood by others: the legibility. There are 2 approaches to legibility utilised through the matrix, the first being 'Implicit' and the second being 'Explicit'. Through combining the 'goals', three different restoration approaches, and two different types of legibility, a spread of 24 concepts was generated.

These concepts were then synthesised into six groups, the application of the groups to the four landscape types allowed for a more in-depth analysis of the way that the different stages and aspects of the concepts interacted. The result of this was a more structured recommendation of the way these groups could be applied to the landscape. The intention of this research was to not to generate one system. However, the concepts evolved to facilitate the compatible arrangement of them in the Mackenzie, to represent the potential integration of the different goals beyond the level achieved by the groups separately. The first stage of the process added to the 'library of ideas' and the second stage tested the application of the concepts – from the 'library of ideas' – in the Mackenzie thorough their integration. The combination of the matrix was the first stage of providing material which the different stakeholder groups could identify with, as they specifically identify an element of the landscape to focus on. The combination of concepts are listed in the groups, so there can be two-way relationship between identifying a group that appears to achieve a goal for a particular stakeholder party, and following the combination of concepts back to the goals which initiated it. The other side of that process is the selection of all concepts generated from a goal, then identifying those goals within the groups for application in the landscape. The second option has the potential to restrict the 'multifunctionality' potential, as there are elements that beneficially impact goals that are not within the concepts that make up the group. However, following a goal through the concepts could prompt the recognition that an action based on one motivation, can have

multiple effects. This interrelation between goals could be the first step of recognising the potential for different stakeholder groups working together for the application of a concept.

The groups presented in this thesis represent the fullest application of the concepts, by combining them to exhibit the relationships possible between them. Stakeholders can vary the emphasis on different aspects, to suit their management plan and existing landscape condition[1]. The investigation of the potential for future productive landscapes in the Mackenzie Basin, the combination of conservation and production, and the removal of existing condition as the deciding factor have implications for the Mackenzie, but also for the wider high country and for New Zealand. The future productive Mackenzie Basin landscapes are representative of the potentials afforded by the latter two. Therefore, they are presented in this order, starting with future Mackenzie landscapes.

7.2 Future Mackenzie Landscapes

This research investigated:

Is it possible to develop a structured mix of compelling multifunctional landscape visions for the Mackenzie Basin?

A part of this is the potential to add to the 'library of ideas' that can be utilised by the stakeholders to achieve the Mackenzie vision, inspiring the stakeholders rather than prescribing actions (Meurk & Swaffield, 2000). The impacts and relevance of these concepts can be seen in their presence in the Groups section on pages 75 of this chapter. Some of the concepts are clearly visible in the layout/structure of their group, (E.g. Concept: 2.3.1) while others guide processes to achieve that structure, such as concept 3.1.2. The generation of a wide range of concepts was intended to ensure a breadth of ideas to then refine. As such, the concepts varied in their value for providing new landscapes uses in the Mackenzie. The process of grouping these concepts served to identify those which best expressed the Mackenzie landscape and identity or translated theory to form.

The removal of the landscape conditions from the first stage, instead focusing on the *intention* of the stakeholders through three levels of restoration had impacts on the variety of concepts generated. The addition of the three degrees of restoration form Seabrook et al. (2011) regardless of the original focus of the goal ensured that there were at least two concepts ('Restore' + 'Explicit' and 'Restore' + 'Implicit') per goal that were driven by restoring the full function and appearance of the landscape. However, as the landscape condition was removed as a precursor, concepts which the

[1] Because there will be situations where the landscape condition will facilitate the ideal situation – it is not always a restricting factor – the landscape can enable the Mackenzie vision.

restoration levels required landscape improvement could locate themselves in a degraded landscape. The original placement of concepts in degraded landscapes in the 'Ideate' stage presented design challenges when the groups were applied to intact landscape conditions, as there was a dominance of concepts which gravitated towards 'Variegated' and 'Fragmented' landscape conditions. The results of the investigation into the possibilities afforded removal of landscape condition are examined later in this chapter. The addition of the restoration type into the original matrix was theoretically to ensure a conservation element in all concepts. See Appendix A: Conservation/production analysis of concepts according to restoration type for the balance between conservation and production through the concepts according to their restoration type. The use of a matrix that required restoration values applied to each concept was appropriate in the Mackenzie as the areas of highest contention were production dominated. The wider goals from the Mackenzie Agreement included recognition of the unique qualities of the Mackenzie (UWSVF, 2013a). One of the defining features of the Mackenzie is its biodiversity. Therefore, concepts that celebrate the biodiversity, placed in an existing agricultural context, added the most value. Adding a degree of restoration to all the concepts, regardless of the goal resulted in a bias towards conservation overall. This may have been because there was not a category in the matrix dedicated to production, as there was for restoration. The context and the Mackenzie goals served to represent the production aspect. The analysis of the investigation into the potential combination of conservation and production are investigated further through this chapter.

Towards the end of the process it was considered if the groups could have been applied to a final, singular site, due to their interrelation. However, this raised the question of if that would have removed the possibilities allowed by presenting that the concepts can be applied separately, or in a hypothetical context? Group one represents a possible scenario afforded by combining all the groups together. When all the concepts have been derived from the same base drivers and informed by the same material it is logical that they are capable of interacting. The variety of scales through the concepts resulted in a variety of scale which the goals could be expressed – through both individual actions and landscape change.

7.2.1 Concepts

Some combinations were more difficult to generate concepts for. This may have been a lack of material, or alternatively – existing representations of that combination. For example, four of the concepts generated for Goal 1: 'Protect water quality' were similar to existing forms and recommendations for waterway management. However, this research presents that even when presenting concepts that bear similarities to existing recommendation that there is value added

through the identification of the values from the Mackenzie Agreement that these concepts represent, and through the confirmation that those concepts formed in other locations *may* be applicable to the Mackenzie[2].

A key dimension of this thesis was to communicate the human scale application of concepts in the Mackenzie context. Therefore, the presentation of pre-existing, or similar concepts in this thesis, at the human scale, was of value to achieving the Mackenzie vision. This is due to explicitly listing them as an appropriate tool for use by the stakeholders, by identifying that they hold elements identified in the Mackenzie vision. The literature review identified a need for a focus on the human scale. What the 'human scale' specified was interpreted differently between concepts. There were some concepts that were implemented by the establishment of plant species of with certain functions. There were others that specified function at a station wide scale. When analysed through the Quattro Stagioni method, the spread of concepts was relatively even. This is presented in Figure 24: Quattro Stagioni analysis of the concepts according to their integration of land uses type, and the level of understanding that they are directed at. The horizontal axis was the legibility of the concepts to the different scales of the community and nationally. These were derived from the Mackenzie Agreement. The vertical axis was the integration of land use for conservation or production. Within this analysis, there are clusters of the different goals. When these concepts were combined into the groups, the intention was to result in a set of concepts/tools that achieved multiple goals. However, in some cases the scale and specificity of certain concepts followed through into the groups. The extent which this influenced the final groups is presented in the following section, alongside the corresponding group. After the application of the groups to the landscape conditions, the relationships between them are analysed, both overall, and depending on the specific landscape condition that is the 'starting point'.

[2] As with all design, the application of any concepts or design would need to be adapted to suit the specific conditions of the site. Just because the from bears resemblance to a concept generated here, the systems required in the Mackenzie context may vary to those elsewhere.

Figure 24: Quattro Stagioni analysis of the concepts according to their integration of land uses type, and the level of understanding that they are directed at.

7.2.2 Groups of concepts

During the application of the groups to the different landscape conditions, a hierarchy within the groups was identified. The groups will be presented according to this hierarchy. Group 1 is the largest scale, it relates to the overall balance of land uses/types and placing of the other goals in the landscape. Groups 2 and 3 guide the interface between production and conservation areas. Groups 4, 5, and 6 are specific processes that would be used to apply the other groups. To reiterate: The intention of this research and chapter is not to present the groups as inseparable. The intent of this thesis is to communicate the potential full utilisation of the concepts in a series of hypothetical sites with certain landscape conditions within the Mackenzie*: " a structured mix of compelling multifunctional landscape visions for the Mackenzie Basin."*

The following two diagrams present the relationships between the different groups and their associated systems when they are applied as a whole system.

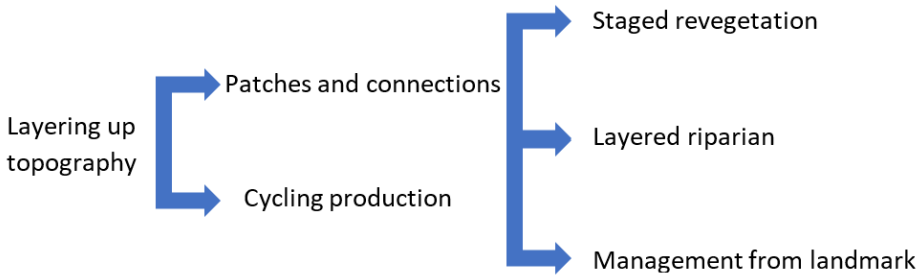

Figure 25: Hierarchy and scale between different groups

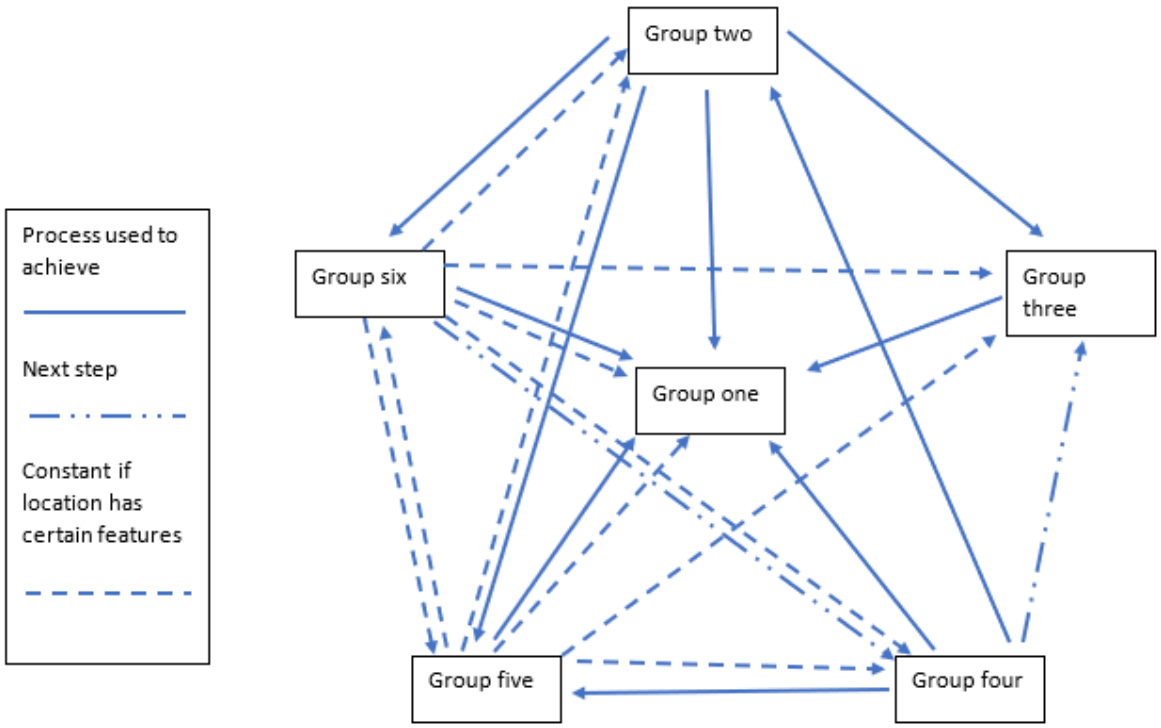

Figure 26: Relationships between the different groups

The details of these relationships are presented throughout the groups.

Group 1 – Layering up topography

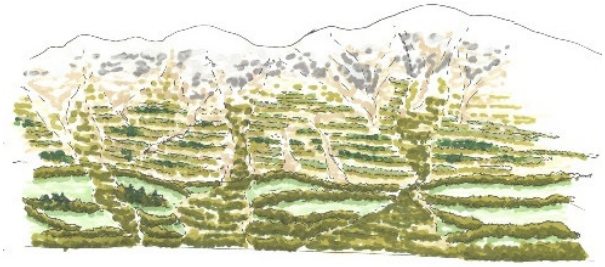

Figure 27: Sketch of group one applied to the side of Lake Pukaki

Group one was initially split into two separate groups. One focused on how the restoration could be applied by layering up the topography, the other focused on how production could do the same. The original groups and concepts were:

- Production: 2.3.1, 4.2.1, 4.3.1, 4.3.2
- Restoration: 3.1.2, 4.1.1, 4.1.2

However, prior to applying each of the groups to the different landscape conditions, it was questioned if concept 2.3.1. could facilitate the combination of both groups. The result of this combination is presented below, to further investigate the potential of the wider application of interaction between conservation and production land uses. The balance between the 'reserve' and the 'production' areas is one of the key issues throughout Makenzie, and a driver of this thesis.

The variety of spatial and temporal scales within this group indicate the value of synthesis through combining different scale and landscape systems, the human scale and perceptible realm (Gobster et al., 2007) can be utilised to achieve larger scale progress.

The differences in the roles which concepts held within the group allowed for synthesis into a system that evolved within the landscape and was adaptable to different settings or landscape conditions.

By placing a concept (2.3.1) that informs the location of land uses first, the productive land uses are guided according in response to the landscape and its systems. In this case 'restoration' and 'production' are not used in an exclusive or binary sense, but to indicate the dominant driver of that area. By managing the locations of production in relation to landscape systems, the sustainability of production is improved by interacting with the landscape in an informed and sympathetic manner. The potential riparian buffers, biodiversity, water filtration and alternative production methods are additional positive impacts of the concept.

Group one represented the potential for layering multiple concepts in one location. Particularly because these three overall concepts each came from a different goal.

Landscapes are holistic, and must be considered as such to achieve multifunctionality (Naveh, 2001). The Mackenzie goals were split and used individually for generative purposes, but in combining the concepts into groups, the potential for relationships and unification are considered. Irrespective of whether the element within a concept was generated from a goal specifically relating to that issue. This is intended to provide the most effective ways to achieve the Mackenzie vision. It also serves to illustrate the myriad of impacts that one change or element can have.

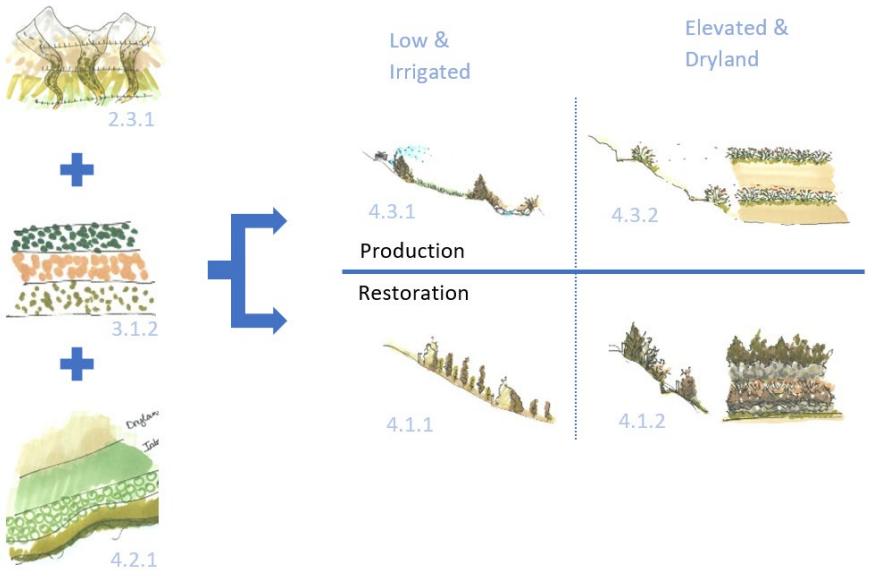

Figure 28: Different concepts that interact within group one. The three on the left are combined for the spatial arrangement of the landscape, and the four on the middle and right guide the production and processes within these spaces.

The implementation of the human scale elements of group one (concepts 4.1.1, 4.1.2, 4.3.1, 4.3.2), requires consideration of the specific climatic conditions of a site – although the consideration of conditions should inform all design decisions. As Meyer (2008) states, design is specific, as such, the conditions in which these concepts are applied, will cause them to evolve from the original concept. The details of the potential application of these concepts is presented in Appendix H: Six groups of concepts

Group one could be applied to a wide range of landscape conditions, however it was directly (i.e. Did not require adaption) applicable to the “fragmented” landscape condition.

Fragmented landscapes are landscapes where the majority of land area has been degraded in some way (McIntyre & Hobbs, 1999). The areas set aside for reserves, according to concept 2.3.1, are to encompass the largest remaining patches, and the revegetation within the reserves moves out from these remnants, focusing on creating connections between the patches and across climatic zones. Any production that is zoned across a remnant patch would be implemented to maintain and enhance the habitat as much as possible.

Group 2 – Patches and Connections

Group 2 'Patches and connections' consists one concept, however this concept did not fit within other groups without losing generative value. The themes present in this group focus on improving connectivity between areas of restoration and improving the health of the associated patches. The steps taken to achieve the concepts in this group link strongly to group three – staged revegetation. The steps taken may be similar, but the spatial and landscape result is different, hence having a separate group as well as how it interacts with the other groups. Within this group, there were two different forms, one explicit, one implicit, either of these could be selected according to the landscape conditions and preference of the individuals in the landscape.

Overall, concept 2.2.2 focused on improving connectivity for biodiversity and recognised that there can be degrees of restoration within an otherwise agricultural landscape.

Concept 2.2.2 has fractal-like elements. This is because the structure repeats at a variety of scales, a defining feature of fractals (Staff, 2012). At a larger scale (viewing the landscape from satellite or aeroplane), the 'patches' would appear as large reserves such as national parks, and the 'connections' would be the remnant areas in between. The scale which this concept was designed, the 'patches' are the smaller, remnant areas within modified landscapes, that served as 'connections' at the higher scale and the 'connections' are the specimen trees. If the scale is further increased, the specimen trees become the patches and the areas along fence lines, or between the trees that are less sprayed or modified become the connections. The concept is based around hospitable areas (patches), and smaller, less hospitable areas in between them that can be used for species movement (connections). This patch and connections model is presented by Heller and Zavaleta (2009) as one of the key recommendations for conservation in the face of climate change. If more intensive revegetation is required, the staged revegetation would be applied between patches along the 'connections' (between the specimen trees) and gradually create solid connections.

The goal that this group closely addresses is the same as the goal that generated concept 2.2.2: Maintain Healthy vegetation cover. This group focuses on improving the connectivity and health of

the landscape; therefore, production aspects are not as closely addressed. However, there would be benefits through ecosystem services provided by a healthier landscape, to production.

As with group one, fragmented is the landscape condition that fits Group 2 the most directly. This can be seen in Appendix H – Group 3: Cycling production

Group 3 – Cycling production

The concepts that make up Group 3 are 2.1.2, 2.2.1, 3.1.1, 4.2.2. The three goals these concepts are from are 'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion', and 'Irrigated and dryland agriculture'. The positive effects of rotating or changing production types on growth has been promoted for some time (Allan, 1985), as has the diversification of land uses and types to increase biodiversity (Heller & Zavaleta, 2009). In this group, the concepts that had features for evolving production systems were synthesised and applied to the different landscape conditions.

This group is the only one which is explicitly production driven, likely a result of the inclusion of restoration types (representative of conservation values), in all concepts. The landscape conditions which the groups are applied to are defined by the proportion of unmodified (i.e. conservation) and modified (i.e. agricultural) land area (McIntyre & Hobbs, 1999). The boundary between agricultural areas and conservation areas is often a hard division (Figure 6). This thesis is also focused on how the different land uses can interact, namely the balance between conservation and agriculture. As such, there is less value in the context for exploring a production focused concept, applied to large areas of the same land type. Interaction occurs most along the boundary. Rather than in monotonous areas dominated by one landscape type. Therefore, this group focuses on how the boundary between two land uses can be less of a hard line, and instead, a typology of its own. Figure 29 presents the relative permeability of landscape types within different land uses, or classifications in this group.

Key	Patch	Buffer	Production
Interior	High		
Edge	Low	High	
Passable/corridor		Medium	High
Inhospitable		Low	Medium
Impassable			Low

Figure 29: Group 3 - Relative landscape permeability based on land use type

This group includes three landscape typologies (detailed in Appendix H) results in three landscape typologies, patch (of unmodified, or fully restored habitat), buffer (see Group 4), and production (agriculture dominated). These landscape typologies consist of five levels of permeability. These codes (Figure 29) represent how permeable that area is to species. The distribution of flora is theoretically enabled by the shelter areas that are interspersed between the production areas, fauna by more hospitable landscape overall.

Group three was directly applicable to a fragmented landscape condition. These diagrams present two scales of the landscape at each step. This is because the overall permeability of the landscape changes due to the actions incorporated in the productive areas. First, Group 5 – Layered Riparian (p. 83) is applied to protect the riparian corridor (if there is one present). The buffer zone identified and established using Group 4 – Staged revegetation (p. 81), and connections are established between the patches using Group 2 – Patches and Connections (p. 79) and Group 4 – Staged revegetation (p. 81). Due to the more degraded structural integrity than a landscape in intact condition, more establishment and associated management to repair the health of the landscape will be required (Park, 1998). Secondly, the intermediate shelter is established in the buffer zone, and the different production methods spread out from the buffer edge. Lastly, the spreading production change meets across the areas of modified landscape, resulting in the overall permeability of the landscape being improved (as per coding), see Appendix H for the application of these typologies.

Group 4 – Staged revegetation

The concepts in this group are 2.1.1, 2.2.2, 2.3.2, 3.1.1, and 3.3.2. The two goals these concepts are from the goals 'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion'.

As with other groups, Group 4 can be interpreted at two scales. The first is the scale presented by concept 2.1.1, which stages the succession of revegetation. Emulating natural succession but managing the area to achieve best planting success. This technique is also presented in group 2, for achieving connections in a fragmented landscape by utilising shelter species and pioneer species. The second is at the landscape scale, where areas of the landscape are managed first improve health, then to provide some form of production. The goals which make up this group are 'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion'. The goals which are *addressed* by this group can be expanded to include 'Irrigated and dryland agriculture' and 'Protect water quality'.[3] Using human scale successional planting, this group can be a tool for riparian

[3] This is an example of where the group addresses more than the goals that are associated with the concepts.

establishment. As presented in Figure 30 identifying the stages to 'completion', there is the option to investigate how a restored landscape can be utilised for alternate production – therefore linking it to goal four: Irrigated and dryland agriculture. The 'use' of a conservation (restored) landscape can be the source of social conflict (Read, 2005; Swaffield & Hughey, 2001). The potential for conflict is recognised, and this research suggests can be utilised as a tool for exhibiting the potential for there to be new ways of being involved in the landscape using this group and representative sites (Lovell & Johnston, 2009b). The first level of involvement is the most typical of recommendations throughout New Zealand – 'finished' restoration. This represents the point where management of the area can be toned down to maintaining the current health and managing external influences such as pests and weeds, as the area is functioning as an ecosystem once more, with succession occurring. Beyond this, it is suggested that through careful management, a harvesting or alternative production system could be implemented. Suggestions include sustainable/successional forestry, or the harvesting of oils or fibre from native species.

Landscape type	Stages of Process				
	Stage one	Stage two	Stage three	Stage four	Stage five
Intact	Pest free/self-sustaining	Harvestable/ sustainable use			
Variegated	Existing areas are self-sustaining, and beginning to spread	Pest free/self-sustaining	Harvestable/ sustainable use		
Fragmented	Improving existing areas	Restored areas are self-sustaining, and beginning to spread	Pest free/self-sustaining	Harvestable/ sustainable use	
Relic	Creating connections and new areas	Improving existing areas	Restored areas are self-sustaining	Pest free/self-sustaining	Harvestable/ sustainable use

Figure 30: Group four - Stages required relative to landscape condition

Green line – Typical restoration finishing point

Brown line – Alternative finishing point – promoting continued investment and exchange in the landscape.

The process employed to achieve either of the finishing points is more drawn out the greater the degradation of the landscape. This group evolved into a system with a range of associated landscape conditions rather than a spatial concept – as can be seen in Appendix H. As such, in order to communicate Group 4 visually, it must be integrated with other groups to provide actionable/ spatial

applications of the verbally communicated system defined here. Group 5 is a combination of both a spatial concept and a system, as presented below.

Group 5 – Layered Riparian

The concepts in this group are 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.1, 1.3.2. This group was entirely composed of concepts from goal one: protect water quality

Although this group is composed of the same goal, it can be used as a tool for achieving the previous groups, alongside groups four and six. As well as representing the potential process of applying this group to a range of landscape conditions.

The characteristics of this group are solely focussed on restoring the riparian buffer along any waterways, including those which only flow periodically. Other concepts and goals feature implications for the water quality in the context of land use or restoration. This group therefore does not examine the productive or conservation opportunities to be found in the waterway. Instead, it focuses on how the vegetation and landform surrounding the waterway can be restored in order to protect the water travelling through it and to reduce the cumulative impacts downstream. The landscape condition is not referring to the surrounding landscape, but instead to the waterway corridor itself. Therefore an 'Intact' condition waterway may feature areas of modification surrounding it, but the riparian corridor and associated corridor is unmodified. Similarly, a fragmented riparian corridor may be in a largely intact landscape, but it still needs restoration to reach that condition itself.

Throughout New Zealand and the Mackenzie, waterways are under pressure and suffering degredation through landscape changes (DOC, 2016). Group five is presented as applied to a variegated or fragmented landscape.

Group 6 – Restoration/Pest management out from landmark

The concepts in this group are 3.2.1, 3.2.2, 3.3.1. This group was entirely composed of concepts from goal three: manage pests and weed invasion. Although this group is composed of the same goal, there is value in examining it as it can be used as a tool for achieving the previous groups, alongside groups four and six.

Because this concept is waves of pest management moving up the landscape, the system itself changes little over the different landscape conditions. The time required to 'complete' would be influenced by the landscape condition, as the number of pests and weeds on the landscape would change the amount of labour and materials required, after restoration was completed, Group 4

could be introduced for a continued exchange with the site. The group being titles “Pest management out from a landmark” indicates a landmark is required for this concept. A ‘landmark’ consists of linear feature that indicated a starting point for an area. Ideally an easily identified and followed feature for legibility. A list of possibilities is: Lake water line, waterway, hill crest, paddock edge, property boundary, bush line. The clearing of the pest species marks the point where that area becomes under the jurisdiction of Group 4: staged revegetation.

The process employed by Group 6 is universal across the different landscape conditions, however the time and resources required are increased according to the level of degradation that has occurred (see Appendix H – Group 6). As the Mackenzie Basin features large areas that have been modified by invasive weeds (DOC, 2016; Grzelewski, 2008; Head, 2016; Hutchings & Logan, 2018), the fragmented landscape condition is representative of the application of Group 6.

7.2.3 Groups

Having gained an understanding of the conceptual/design results, the implications of the groups on achieving the Mackenzie Agreement’s vision will now be presented. This section will present the analysis and results from the groups, as they apply to future Mackenzie landscapes. One of the features that this research asserts indicates the potential for a group to contribute to the identification of future Mackenzie landscapes is the applicability of that group. The applicability value refers to the level to which the group can be applied to solve various Mackenzie challenges, as identified by the Mackenzie goals. The applicability generally indicates the spread and inclusion of goals within a group. Some of the groups are only applicable to one goal due to the specificity of the context for some of the concepts generated through the matrix (e.g. Layered riparian). The use of common theory to guide the generation of all concepts, helps to integrate apparently separate concepts. The number of concepts in a group did not determine the validity of a system. However, it did facilitate the application to various landscape conditions when there was variety in the potential contexts for an action[4]. The wider scale groups can apply the more specific groups as part of a wider system because they share the same goals and restoration elements. These combined elements are the answer to the research question and are the first iteration of future productive landscapes in the Mackenzie. The interconnection of the groups, despite their similarities and differences through the design process, is in alignment with the use of multifunctionality as a tool that can create solutions that offer specific design guidelines, whilst achieving multiple goals (Lovell & Johnston, 2009b). The applicability of a some of the concepts was indicative of their multifunctionality. If they were able to

[4] Such as Group 6: pest management from landmark, which was applicable to a range of landscape conditions and situations, whereas riparian was dependant on a waterway/riparian corridor.

be adapted to either express different systems, different intent by stakeholders, or landscape context, this research suggests that those groups are likely to be more successful in providing multifunctional solutions to the goals. The alignment of goals with groups is presented below in Figure 31.

Mackenzie goals	Grouped concepts from the matrix						Combination of all groups
	Group one	Group two	Group three	Group four	Group five	Group six	Level of applicability
Protect water quality	**	*	**	*	***	**	**********
Maintain healthy vegetation cover	***	***	**	**	**	**	**********
Manage pests and weeds	**	**	**	**	**	***	**********
Mix of irrigated and dryland agriculture	***	*	***	**	*	*	**********
Total for group	10/12	7/12	9/12	7/12	8/12	8/12	

Figure 31: Applicability of the six groups to the four Mackenzie goals. Applicability indicates the extent to which the group addressed that goal.

The grouping of concepts was to investigate how interrelated the landscape systems and land uses can be when derived from different components of the overall vision. Group 1 – Layering up topography, alongside the other groups, was ranked according to the level which they achieved the Mackenzie goals. The total list of the analysis of the groups can be found in Appendix B: Groups according to goals met. The two goals that were most consistently achieved were two and three. These focused on maintaining a healthy vegetation cover and managing animal pests and weed species. According to this analysis, 'Protect water quality' was not as well achieved. This was likely because it is specific to a landscape feature – a waterway. The interaction between land use and water quality were considered in many concepts, but not as the main theme. Other than 'Group 5: Layered riparian', the groups did not apply specific interventions for protecting water quality. They implemented features that would reduce the pressures on water quality, but within wider systems, for example in the considered use of irrigation in Group 3: cycling production. The other element for consideration is that water quality is a nationwide, and prominent issue in New Zealand (Joy, 2018; RNZ, 2018). Therefore, although as a goal it has not been as thoroughly examined as others may appear to have been, there are existing practices addressing water quality. In contrast, there are less accessible concepts for integrating production and conservation as land uses, rather than either sides of a border – rather the removal of production from conservation areas.

The Group 1: Layering up topography, addressed the widest spread of goals. The last four groups each feature similarities with one of the original goals. The first two groups arrange and implement the latter four. This explains why Group 1 achieves the greatest applicability of the goals: is made of the other groups. Figure 32: Group and goal alignment shows the last four groups with their corresponding goals. As can be seen in the analysis of the groups alongside the goals in Figure 32, all the groups achieve elements of each goal, but they are more directly applicable to those presented in Figure 32.

Group	Goal
Group 1: Layering up topography	All
Group 2: Patches and Connections	All
Group 3: Cycling production	Goal 4: Mix of irrigated and dryland agriculture
Group 4: Staged revegetation	Goal 2: Maintain healthy vegetation cover
Group 5: Layered riparian	Goal 1: Protect water quality
Group 6: Pest management from landmark	Goal 3: Manage pests and weeds

Figure 32: Group and goal alignment

These types and interactions were not lost when the groups were combined, merely transformed. The higher-level Group 1 and Group 2 are a combination of both legibility types, as they place human systems alongside natural ones. The other four groups are elements that are utilised for the establishment of the above groups. The last four groups are processes that are applied at individual sites, to create the overall landscape change seen in group one. After the last four groups have been woven together to create group one, in a manner that is sympathetic to the landscape (as required by Group 1), they become features that express the natural systems. This research suggests that this could result in in an understanding of the human processes required for a landscape to be restored, and emphasis in the landscape on the natural systems once restoration is complete.

Ongoing expression of human systems is present in the management of the production dominated areas, and in pest management in the conservation dominated areas. Additionally, implicit legibility is used to express nature in the reserve areas, and explicit legibility is used to express the continued human care in the production landscapes. In these concepts, a production dominated landscape expresses the aesthetics which are representative of ‘care’ and therefore human systems. The retention of conservation elements in a landscape which communicates the care of others, shows that that the conservation elements are intentionally there. The value placed on the conservation areas by retaining and managing them is representative of the individual, and to a greater or lesser extent, the community. As Nassauer (1995) quotes Aldo Leopold “The landscape of any farm is the owners portrait of himself”(Nassauer, 1995, p. 162). The way these human systems are arranged and

expressed, expresses the landscape systems. For if a productive system is implemented in a sympathetic way to the natural systems, the two will be complimentary. The resulting patterns can express both the way the production interacts with the landscape, but also the way the individual interacts with nature (Abbott, 2018; Bowring, 2010). Even if the biodiverse, or ecological areas are not as dramatic as a stand of forest, the 'negative space' between the production dominated areas, will communicate the commitment to supporting the ecology. Combining the intent to change management types to be multifunctional, with certain aesthetics will increase the contrast between areas that are being managed in this way and areas that are not. This research suggests that this contrast could serve to exhibit the potential for a landscape that integrates conservation and production, while supporting the community, compared with the landscape type that has prompted the Mackenzie Agreement (2013a).

Group	Legibility
Group 1: Layering up topography	Natural and Human
Group 2: Patches and Connections	Natural and Human
Group 3: Cycling production	(Stage 1) Human (Stage 2) Natural
Group 4: Staged revegetation	(Stage 1) Human (Stage 2) Natural
Group 5: Layered riparian	(Stage 1) Human (Stage 2) Natural
Group 6: Pest management from landmark	(Stage 1) Human (Stage 2) Natural

Figure 33: Group legibility type

Within the grouping of the concepts, as seen in Figure 31, certain goals were common throughout the groups. With 'Maintain vegetation cover" and "Manage animal pests and weeds" both ranking above two out of three stars consistently across all groups in the individual group analysis against the goals. This is likely due to the myriad of way those goals could be achieved. Maintain healthy vegetation cover is integral to the success of any restoration efforts. The managing of pests and weed species is required for the same reason, and for successful production in an agricultural context. Even the most location/context specific groups, Groups 5 & 6 both had elements of Goals 2 and 3. Group 5 – Layered Riparian required the removal of pests, and the restoration of a riparian buffer. Group 5 is presented as applied to a variegated or fragmented landscape. Group 6: Pest management from landmark involved restoring the native vegetation through the removal of weeds and pests in a systematic manner. Goal one: Protect water quality and Goal 4: Mix of Dryland and Irrigated production are more specific. Therefore, the generalisation can be made that, specific goals usually result in specific solutions. Additionally, that general goals can be achieved in other goals concepts, as well as within their own. The combination of concepts from a variety of goals could be seen to have been driven by the common elements through the goals. These elements were key

parts of the general goals and helped achieve the more specific solutions from the more specific goals. They then evolved into the groups.

The methods utilised through this research resulted in a structured mix of concepts that addressed all of the Mackenzie goals. The matrix combinations resulted in a variety of concepts that were combined into groups that are applicable across a range of scales, and although they could have been combined and applied to a single, real world site, there was greater potential for the stakeholders in leaving them to envision how the concepts could adapt to the unique and specific locations through the Mackenzie Basin. Increasing the understanding of a landscapes appearance, and how that appearance links to landscape and human systems is essential for continued support for that landscape. Using Mackenzie specific patterns and species was required to create (and maintain) the unique landscape character. The climatic and landscape conditions of the Mackenzie are some of the most extreme in New Zealand (Grzelewski, 2008; Hutchings & Logan, 2018). The designs and patterns that are applied to the landscape need to acknowledge and express this. By doing so, these results suggest that the recognition of the Mackenzie nationally and internationally will likely increase, through increased legibility of human care and landscape systems.

According to the literature that informed these concepts and research, if these more legible patterns are consistently applied, an increased understanding of what is ecologically valuable will occur. There are areas of New Zealand that are as unique and valuable as the postcard rainforests, a closer look or greater understanding is just required to see it. For those unfamiliar with the Mackenzie, the visual difference between intact and degraded landscapes may not be as legible as in other areas of New Zealand, therefore new ways of expressing and valuing the landscape are required. The introduction of legibility to the matrix was to achieve this was intended to increase understanding. Through increasing understanding of the restoration process, to communicating the care applied by the individuals who call it home.

7.3 Combining conservation and production in the Landscape

The second component of this research investigated the potential to provide alternatives to the dichotomy of New Zealand landscapes by integrating production and conservation landscapes. One solution envisioned was the combination of conservation and production in the landscape through multifunctionality. The combination of a productive context and conservation (restoration) variables through this research has resulted in 6 Groups which present 24 different levels of conservation/production blend through their setting in different landscape conditions.

Although the intention was to integrate the different functions, only Group 3 was explicitly production driven. This may have been because of the inclusion of conservation (restoration) in all of the concepts and therefore the groups. This inclusion is due to the landscape context for these concepts being production dominated. This is because the production dominated landscapes are currently expressing human management, and the ones which are managed by private individuals. Conservation landscapes are generally managed by DOC.

Therefore, any combination is targeted at driving the reintroduction of conservation in production landscapes. The emphasis on conservation was a response to the context of the Mackenzie, where large areas of the landscape are managed the same way as they have been for decades. This management has resulted in a widespread, gradual degradation of ecosystems. A total of 95% of land is either Pastoral lease or Freehold/other. Only 5% is under DOC management (UWSVF, 2013a). It is assumed that the landscapes under DOC management are conservation dominated and the landscapes under pastoral lease/freehold/other are production dominated. The more extreme and rapid landscape changes are those that have prompted the Mackenzie Agreement (2013a). Therefore, the dominance of conservation in the research process was a response to the Mackenzie Basin being dominated by production land uses, resulting in conservation needing a more explicit involvement. The presence of conservation in each concept was essential to balance the production context with restoration intent.

The context for these concepts were not national parks or reserves managed by the Crown (DOC). Those landscapes would have accordingly been conservation dominated and the restoration element of the matrix could have been exchanged for a production focused variable, if the viability of the reserve was in question, but that is not the focus of this research. The focus for this research was the Pastoral lease, and freehold stations, managed by individuals, that make up much of the Mackenzie (Appendix D). Therefore, to balance the fact that the concepts were being applied to a landscape that favoured production, the concepts themselves, and the process to generate them favoured conservation. These concepts ensured conservation and biodiversity a place in the production landscapes of the Mackenzie. By doing so bringing human dominated landscapes into intentional relationships with nature (Nassauer & Faust, 1995). These concepts can be used to garner support for both the unique species and the humans who rely on and inhabit the Mackenzie. This is the manner in which the ecological values are likely to increase the greatest through the creation of networks and connectivity and the ability to adapt to change. The other reason for the focus of conservation onto production land is that the effects of production on conservation land have resulted in the dichotomy and landscape types present in New Zealand landscapes today. The

identification of a target starting landscape type is also necessary due to the harsh line drawn around what is/isn't either production/conservation. There has been conflict in the past in New Zealand regarding acceptable practice on areas perceived as naturally healthy (Landscape in New Zealand p. 13). This presented in the Mackenzie documentation through stakeholders belief that ecologically rare or valuable land can be a restricting factor (Hutchings & Logan, 2018). Unfortunately, this can result in severe degradation of the productive landscape and a hands-off approach to conservation land. In Mackenzie, more active management is required (Hutchings & Logan, 2018).

Therefore, in modifying boundaries, we can hope to introduce a whole additional landscape type, and another, and another as the layers build. If the concepts and groups were to be applied hypothetically to a conservation landscapes, the actions would likely resemble those presented by the groups when applied to the 'intact' landscape condition.

7.3.1 Concepts

The original analysis of each of the individual concepts according to their restoration type showed differently than the overall. The breakdown of the entire list of concepts can be seen in Appendix A: Conservation/production analysis of concepts according to restoration type. 'Restore' was the only restoration type that had higher conservation value. For 'Repair' and 'Reinvent', production scored higher. 'Repair' had the lowest conservation ranking but was second in production. This indicates that committing to full restoration or reinvention, results in higher conservation value than repairing to an intermediate point. The bias towards conservation exhibited itself in the 'Restore' concepts as agriculture being temporary or secondary to the restoration efforts (Concept 4.1.1 or 4.1.2). Or, more accurately, the loss of some conventional production was exchanged in favour of restoring the landscape health. This did not typically require eradication of production. Both production and restoration were present in the 'Restore' concepts, the proportions /emphasis of either changed depending on the original goal. The bias towards conservation can be seen in the overall analysis shown in Figure 34: Analysis of restoration types for conservation or production bias. Although, within the four goals that were used to generate concepts, there was only one that explicitly referenced agriculture. Compared with the tree other goals that have more direct implications on ecosystem health. Therefore, the overall dominance of conservation is a logical result given the ingredients used in the generation of the concepts. As mentioned previously, the bias within the concepts to conservation is a response to the context intended to balance the bias towards production in the landscape.

Restoration type	Conservation	Production	Total
Restore	*********	*****	**********
Repair	******	*******	**********
Reinvent	*******	********	**********
Total	22/30	20/30	42/60
Percentage	73.3%	66.6%	70%

Figure 34: Analysis of restoration types for conservation or production bias

7.3.2 Groups

The group that best exhibited the potential for integration and balance between conservation and production was Group 1 – Layering up topography. It was also the group with the widest scale, and therefore could communicate balance at a station level, rather than feature specific locations (E.g. Waterway) or actions (E.g. Successional revegetation). Group 1 advocated for the designation of areas that were production or conservation *dominated*. This did not require the separation of these areas. Only that there are gradients within the landscape which favour certain functions. The production *dominated* area may be 80% production area, but the conservation networks throughout it make up the other 20%. The networks and connections between the two areas are the locations for the most diversity of form and function occurs. They are also opportunities for innovation and interaction, to make legible the natural and human processes within a landscape.

To conclude the results for the investigation into combining production and conservation, the process and results from this research present that there are potential ways which conservation and production can be integrated in the landscape. The process taken through Design Directed Research to generate these concepts must reflect the existing landscape, and the intentions of those in the landscape. The restoration level that resulted in the highest achievement of both conservation and production was 'Reinvent'. While there are areas presented through these concepts that are production or conservation dominated the intention was not to present a new type of homogenous landscape, of entirely integrated 50% production, 50% conservation. The intention was to present the potential combinations, where there are levels and layers of different conservation and production. This included the different layers and emphasis of both. The inclusion of restoration levels had the potential to associate landscape conditions to the concept. The concepts were therefore generated without a specific condition identified, only the overall context of the Mackenzie. The impacts of this removal and reintroduction are presented in the following section.

7.4 Determining restoration by intent rather than existing condition

The final question that was investigated through this thesis was the potential value of removing the landscape condition as the dictator for what can occur within a landscape. As identified regarding the concepts in the 'Future Mackenzie Landscapes' section of this chapter, some actions require a specific context. The Mackenzie goals were set in a landscape that varies from 'Variegated' to 'Relic'. The groups were generally the most directly applied to the fragmented and variegated landscape conditions. 'Relic' presented issues regarding the amount of resources required to 'Restore' to an 'Intact' landscape, whereas 'Intact' had the opposite problem. For an 'Intact' landscape, it was challenging to advocate for a concept that requires degradation of pristine habitat through applying production. The solution presented for this varied through the groups, from: avoid if possible, to manage sustainably, or to offset with other actions, integrated and managed sustainably. In that regard, the solutions were consistent with existing approaches, however, the production of non-commodity out puts should be considered and encouraged.

The precursor for this research was that deciding the type of restoration based on the existing landscape condition restricts the possibilities for any given landscape, both the ecological and economic. The state of the original landscape was removed from the first stage of concept generation, focusing more on the intent of each of the matrix variables. However, the state of the landscape they are invested in, combined with what they are looking to achieve are two of the most identifiable starting points for stakeholders. The second stage of concept generation adresses this 'how do we know where to start' by grouping the concepts with commonalities from stage one, these groups were then applied to the four different landscape conditions identified by Park (1998), as presented by Meurk and Swaffield (2000) in regards to restoration in New Zealand. The analysed and grouped concepts from stage one have been applied to hypothetical landscape conditions that are: 'Intact', 'Variegated', 'Fragmented', or 'Relic'. Theoretically resulting in concepts which stakeholders can utilise, unrestricted by their existing landscape condition in how they can apply the Mackenzie vision, and shaping a landscape that supports a range of ecosystems and land uses sustainably.

To prevent the deciding factor for any restoration efforts being "what is there", rather than "what could be there?", stage one concepts were generated based on intent (the combination of the matrix variables), rather than existing landscape condition. Some of the goals were focused upon certain landscape conditions/elements, which resulted in concepts formed in/around that context. Such as 1.1.1, which is located on a riparian corridor or 3.2.1. which is the pattern of invasive weed

management from a boundary (in this case a lake edge), this appears to restrict the use of these concepts to landscape situations where these features are present.

As identified by Meurk and Swaffield (2000), there are few, if any, locations in New Zealand that can be classified as fully intact. This was included none the less to fully examine the groups and allows for a future where New Zealand may achieve areas of 'intact' landscapes. Intact is also used as a goal state/situation where appropriate. This is because, although the landscape conditions are dominantly a guide for the starting point, they can also be a goal. Not just a 'before', but an 'after' as well. Ideally in a ecologically positive manner (increasing rather than decreasing health).

The other issue encountered through this research was the conscious or subconscious association of certain actions and concepts with landscape conditions. Such as those concepts for Goal two relating to pest and weed management were automatically applied to hypothetical situations with a pest and weed problem. I could be suggested that this is a logical connection – how can the problem be addressed if it isn't in a situation where the issue (e.g. Concept 3.2.1 for Pest and weed invasion) is present? On the other hand, the intentions of this research were to investigate the possibility of actions to be taken to achieve the Mackenzie vision regardless of the existing condition. Therefore, concepts that can only be applied to certain conditions indicate that in some cases it is not possible to remove the landscape condition. Overall, the removal of the landscape condition in this research resulted in concepts that evolved to the landscape best suited for the goal/restoration type/legibility type combination, such as conveniently spaces patches of vegetation for Concept 2.2.2. The removal of the existing landscape condition lead to the 'library of ideas' holding concepts covered a variety of landscape conditions. The application of concepts that modified the landscape from an intact state, were weaker than those which were applied to the variegated and fragmented landscape conditions. This is because the landscape context which the concepts were generated in the first phase, were those generally landscapes that required intervention and management to improve health and connectivity. Therefore, it can be said that although removal of landscape condition is a positive tool for broadening the scope of concept generation, there are cases where the landscape condition and the actions/intent are inseparable.

Chapter 8

Concluding discussion

The concepts identified through this research applied theoretical literature relating to ecology and legibility, using multifunctionality as a tool to combine multiple areas of theory. Legibility was one of the values that was uncovered through the literature review (Corner & Czerniak, 2007). The inclusion of aesthetic and cultural aspects into a design context/ challenge that was focused on conservation and production is representative of this breadth and the possibility for applying such theory outside of an urban context, especially in contexts with (perceived) conflicting land uses. Pivot irrigation was not included in these concepts as it was considered important to examine the productive possibilities of the Mackenzie Basin without large scale irrigation, as well as placing this research alongside existing projects. The way these concepts could change the perception of conservation/production interface in New Zealand are discussed, alongside opportunities for further research.

This chapter discusses in the following sections how there were 3 values identified through the research, and three questions asked. This research has implications on the relationship between conservation and production in the Mackenzie Basin and wider New Zealand, including what is classified as a 'productive' landscape. This research identified a range of future landscapes, or tools and concepts that can be used to progress the Mackenzie vision into a reality.

8.1 Reflections on, and Questions for Future Productive Landscapes in the Mackenzie Basin

Three values present in the Mackenzie Basin were identified at the beginning of this research. The first was the dissonance between the picturesque precedents of New Zealand conservation landscapes, and the appearance of the Mackenzie Basin. The second was the additional conflicts introduced through technology advancements resulting in irrigation technology in the Mackenzie, and the resulting landscape change. The third was relationship between these landscape biophysical qualities and the community identity of the region. The three values are expressions of the Mackenzie Basin context, which the following three questions investigated through this research are the response to.

The main driver of this research was to investigate if it was it possible to develop a structured mix of compelling multifunctional landscape visions for the Mackenzie Basin. Two additional questions

arose through this process: what is the potential for levels and layers of conservation and production values through all landscapes? and; what are the opportunities afforded by removing the Landscape condition as the deciding factor for an action? These are reflected on through this section.

8.1.1 Value 1: Picturesque and the Mackenzie Basin

The picturesque influence on the majority of New Zealand's landscapes is generally not aligned with the appearance of the Mackenzie Basin, the landscape is dominated by subtle landforms and vegetation, in comparison to other areas of New Zealand that feature mountainous forest, a significantly more picturesque scene (Bowring, 2010; Nightingale, 2003). This generalisation applies to the conservation and the production landscapes, as defined in the Mackenzie Agreement, below 800m elevation. These are the areas of more level topography, with extensive glacial landforms (UWSVF, 2013a). The areas above 800m are generally more protected that the level areas (Appendix D and Appendix E), they also bear closer resemblance to picturesque landscapes or 'scenery'(Bowring, 2010; Nightingale, 2003). The glacial moraines and outwashes of the Mackenzie Basin are home to some of the rarest biodiversity of New Zealand and the Mackenzie Region (Emberson et al., 2018; Grzelewski, 2008; Head, 2016; Maloney et al., 1999; Meurk et al., 2002; Norton et al., 2006). However, this valuable biodiversity is located in a landscape that does not express this value as clearly as other areas in New Zealand – such as the areas of mountainous rainforests. Therefore, it is the responsibility of those within the landscape to express and consequently protect the values found there (Gobster et al., 2007).

There is dissonance between the picturesque and the Mackenzie due to the association between 'naturalistic' or 'picturesque' landscapes being associated with ecological health (Saunders, 2013). The Mackenzie is a landscape that holds high biodiversity value, expressed in a subtle manner, and as such, not aligned with the typical picturesque scene (Ellison, 2013). Therefore, the expression of value and care of these landscapes is necessary to communicate and protect their richness and health through any future social and landscape changes. Concepts and management need to create a set of landscape patterns that express the Mackenzie Basins unique values – with elements that are familiar and express care, in a way that responds to the landscape rather than placing concepts from different contexts. The placement of practices from other areas, with little adaption to suit the climatic and cultural conditions of the Mackenzie Basin was the catalyst for the second conflict identified through this research.

8.1.2 Value 2: Technology and Landscape change in the Mackenzie Basin

The second value present in the Mackenzie is the conflict between the progression of technology into a landscape that has been relatively constant visually for generations (Swaffield & Hughey, 2001). The conflict arises when the technology implemented by individual members drives landscape change that affects the whole community, this is especially apparent when some members of the community object to the change, for aesthetic, ecological, or cultural reasons. The introduction of pivot irrigation into the Mackenzie has driven the formation of the Mackenzie Agreement, and the publishing of the Opportunities for Agency Alignment documentation (Hutchings & Logan, 2018; UWSVF, 2013a). This conflict also brought to light the issues in New Zealand surrounding the perceived 'risks' of land falling into private ownership or management. This thesis is written following prior investigations into the potential designs for the areas under pivot irrigation in the Mackenzie Basin (Derecourt, 2017). As such, the focus is the areas that are not yet irrigated, or are impractical to irrigate, as the irrigated areas have already been addressed. It is recognised that one of the drivers for the introduction of irrigation is the associated appeal of a perceived increase in production. Therefore, this thesis investigated the potential for the integration of different types of production, that are more sympathetic to the landscape and biodiversity. Due to the presence of 'irrigated and dryland' agriculture in the Mackenzie vision, irrigation is incorporated in some concepts and groups, but as a tool for establishment of more sustainable practices, rather than the continued production technique.

This conflict caused by pivot irrigation (Littlewood, 2018a; Taunton, 2018) is an example of not appropriately responding to the site and taking into consideration the unique landscape and conditions (Burns & Kahn, 2005). Or the effect of globalisation, exhibiting in the Mackenzie as where rapid change occurs in a landscape that has evolved gradually over time, through the impact of external knowledge and systems (Swaffield & Brower, 2009). The introduction into the Mackenzie Basin of any systems that have been designed and implemented successfully elsewhere needs to be examined in detail, prior to implementation. The ability for a change to be made, does not means that it should be made in that location or in that manner. Humanity has a responsibility to act as caretakers for this unique landscape, in order to ensure it does not follow the Canterbury plains in experiencing almost total obliteration of all habitat by intensification (DOC, 2016), there is still the opportunity to prevent this occurring in the Mackenzie Basin, this research presents concepts that could be applied to achieve this protection. However, those in the landscape should be able to support themselves and their families, while caring for the Mackenzie Basin so that it may be experienced for generations. The impact of landscape changes on the community are reflected upon in the following value.

8.1.3 Value 3: The Mackenzie Basin landscape and community identity

The final value presented here is the relationship between the unique landscape, it's many different facets, identified in the previous two values, and the community identity associated with it. The change that has occurred in the appearance of the Mackenzie Basin landscape has heightened tensions between those within the Mackenzie Basin who feel as though they need to advocate for 'their' aspect of the landscape (Hutchings & Logan, 2018). There are tensions regarding the privatisation of land in New Zealand (Swaffield & Brower, 2009), these are generally associated with the perception that individuals will not manage the area as 'well' as the Crown/public would (Read, 2005). These tensions, alongside other landscape changes have resulted in the perspective that members of the community must choose between supporting productive or conservation in the landscape.

The values present in the Mackenzie Basin explained above, were combined with those from the Mackenzie agreement. Resulting a series of three questions that investigated the following aspects of any potential future in the Mackenzie Basin and the implication of these on wider New Zealand.

8.1.4 Question 1: Future Mackenzie landscapes

One of the issues identified in Landscape in New Zealand section was that the landscape was a physical entity, experienced visually. This observation was followed by a review that identified that the landscape is far more than the physical form and is experienced in ways other than the visual characteristics. In the Mackenzie, the expression of values beyond the visual are essential due to the unique appearance of the Mackenzie. In the Mackenzie Basin, ecologically valuable habitats, as well as the productive areas and associated human management sit subtly in the landscape, the areas of pivot irrigation were not the focus of this research. The concepts generated by the current research needed to express the time and commitment by the individuals in the landscape, ideally while drawing attention to the biodiverse areas. The approach taken to address this was the inclusion of theory that advocated for expressing these values through the associated landscape systems and human actions. This research approached this by emphasising and framing areas, using the progression of landscape change, or the form of it to express the involvement of the community and their actions.

The landscape change, which itself was and expression of individuals actions and values that prompted the Mackenzie Agreement, was the influx of irrigation, and greening of Mackenzie Basin (UWSVF, 2013a). This was a landscape change that was negatively received by some of the community (ECAN, 2018; Hutchings & Logan, 2018; Littlewood, 2018a; Taunton, 2018; UWSVF,

2013b). There are likely to be visual landscape changes to the Mackenzie Basin through the implementation of the concepts generated by this research. The challenge then is to communicate that the change is intentional, benefiting the ecology, benefiting the community. While also expressing that the Mackenzie Basin is not a static landscape, destined to be eternally covered in tussock. One option this research identifies is the use of representative areas where the landscape change is accelerated by visible human involvement, such as cues to care (Nassauer, 1995) or taskscape (Ingold, 1993) actions (planting with associated stakes, plant protectors, fencing). This would ideally mean that when the change occurs within other areas, through natural succession, that it is recognised to be a positive process, representing a healthy landscape function. This expression and use of representative sites can lead to the association that private ownership can empower positive change. The change occurring in parallel between public and private areas would express this. This legible positive impact by private individuals on privately managed land, would be the first step in creating positive associations for the wider community, repairing the damaged reputations of those who manage the land.

This research recognises that there may be impacts of the visual landscape change on the landscape 'Image', to local and national communities. This research finds this is a change that needs to be represented through the community and media as positive. Showing a new approach to the protection of the biodiversity in a landscape that does not express its richness in the manner that is typically recognised in New Zealand. The collaboration with members of the community is a start in achieving this and aligns with the work done by Duff et al. (2009), advocating for collaboration throughout, rather than the integration of different communities work when a project nears the end.

One of the key features for making the change possible in the Mackenzie Basin, is that the concepts needed to be at the human scale, so they could be understood and applied by runholders and stakeholders. The generation of these concepts at a human scale was intended to have the flow on effect that the implementation of these concepts was legible within the perceptible realm. There were a variety of scales used throughout the research. The generation of concepts was located at the human scale, but the application of the groups of concepts generated through this research to landscape conditions resulted in the introduction of a wider scale (the landscape condition), as it was required to ascertain what condition the landscape was in.

This research finds that the drawing back down to the human scale can be achieved through the different scales within the concepts and even the last three groups. Each group has the concepts that make it up coded, these concepts are at the human scale. The groups identify and present the

impacts applying the concepts and wider process through the application to different landscape conditions. The concepts are located within the perceptible realm, they are the human scale expressions that will be experienced in the landscape. There were common systems that informed or were present in the make-up of most of the groups (see Figure 26: Relationships between the different groups). The landscape condition expressed the level of modification that had occurred in the landscape. The two landscape conditions that were the most challenging were the extremes of the 'Intact' and 'Relic' landscape condition. This is because in the intermediate conditions, there was and existing mix of landscape modification levels to utilise the relationship between. Whereas the two extremes required the introduction of either the conservation or production values. The combination of conservation and production was directed at the border areas, where conservation and production landscapes interacted. Therefore the 'Intact'/'Relic' landscape is challenging due to limited interface between the different land uses. The balance between these different land uses are discussed following, as the balance of conservation and production relates to the values held for different landscape conditions throughout New Zealand, not just the Mackenzie.

8.1.5 Question 2: Conservation and Production

This research finds that the values associated with being productive do not always require being ecologically desolate; nor does achieving biodiversity outcomes mean a loss of production potential. This research demonstrates ways New Zealanders views can be changed regarding "production" versus "conservation" landscapes, because the aspects that are identified in conservation landscapes and value are interwoven with the production. The flip side of this is questioning if production can be reintroduced to conservation areas? – "re-introduced" because up until recently, the wild areas of New Zealand were a rich source of a wide range of resources. Generally speaking, past production was the placement of worldwide production (agriculture) methods and technologies into New Zealand's unique landscapes and ecosystems (Swaffield & Brower, 2009). This research asserts that new patterns and methods need to be developed specifically for the unique New Zealand context. However, any decision to change the structure of an area of previously unmodified landscape must consider the role it plays in the wider network, ensuring the functioning of the site in the ecosystem. As identified on p. 30, modified landscapes can be platform for expressing the different ecological functions of a site.

The other element within the conservation/production binary, is what constitutes a 'productive' landscape. One of the key findings from this research is that 'production' is not exclusively requiring 'yields' or commodity outputs. 'Production' as it has been used through this process began as referring to the areas managed for the agriculture industry, producing commodity outputs. At the

end of this research, the term production has widened to encompass elements and values that do not currently have an associated monetary value – the non-commodity outputs. The combination of commodity outputs (CO) and non-commodity outputs (NCO) is a key part of multifunctional landscapes. However, while these landscapes are multifunctional, so are conservation dominated areas of the new landscape typologies presented in this research, leading to the introduction of 'cultural' landscapes.

Cultural landscapes are referred to as the landscapes that express cultural preferences rather than natural systems (Meurk & Swaffield, 2000; Newton et al., 2002). This research suggests that these are possibly a more appropriate term for the highly modified landscapes that represent the social drivers that shaped them, rather than the landscapes they are within. With the typical agricultural, or highly modified landscapes no longer monopolising the 'productive' term, it can be applied to a different typology. Through this thesis, the question of what defines a 'productive' landscape has been relatively easy to allocate due to the dichotomy of New Zealand landscapes. At this stage, the potential for many different landscapes that include "production" (as it was understood at the beginning of this research) and "conservation" has been recognised. Therefore, the agricultural landscapes that were labelled productive at the beginning of this research, take on the label presented by Meurk and Swaffield (2000) of 'cultural' landscapes. The potential integration and layering of landscapes such as those presented in this thesis take on the 'production' identity. This is because, as identified in non-commodity output and commodity output section (Wiggering et al., 2006) , there are more values provided by a landscape than the amount of fibre or kilogram of animals harvested.

If the potential for overlap and different levels of values in a landscape were recognised, would 'productive' landscapes begin to diversify? The issue with expressing the potential options is that New Zealand has few existing examples of integrating production and conservation (Abbott, 2018). Orongo Station, in Gisborne has been praised for 'weaving' together restoration (conservation) and production (*Orongo Station Conservation Master Plan*, 2010). However, most high-country stations do not have access to funds required to individually recruit a Landscape Architecture firm to masterplan the station. The potential risk for examples such as Orongo is that they detrimentally affect the potential for others, of more modest financial means, to consider implementing a management scheme that integrates conservation and production (Abbott, 2018). It reinforces the association between conservation efforts being inaccessible for the 'average' stakeholder, due to the detrimental effect on production potential. The application of these concepts requires buy-in from the stakeholders and acceptance of the *possible* (not guaranteed) loss of 'conventional production'.

A response to the reduction in the amount of a commodity being produced, could be to increase the quality of product being produced (Abbott, 2018). The quality of the product extends beyond that which the customer receives. What if the relative 'quality' of the systems that are employed to create that product are valued as highly as the result? Introduce the "make chips not potatoes" approach, where the value of the product is increased through the marketing of the associated processes, rather than the raw material (Abbott, 2018). With increased awareness of the impacts of conventional farming on the environment, having an industry or region that is improving the ecology of an area has got to be a selling point?

There is potential for Māori values on production to be integrated in new landscape patterns. The differences between the European concept of production and therefore the could result in layers of conservation and 'production', including Māori land management in a complimentary relationship with colonised methods. This combination could lead further into the approach of working with the landscape, rather than placing human systems dictatorially on areas. This combination would be driven by a cooperative relationship with the landscape – rather than humanity as conqueror of nature (Fischer et al., 2007).

This research identifies that the evolution of the landscapes in the Mackenzie Basin to explore other production possibilities and landscape condition may involve the reintroduction of habitat to otherwise monocultural or highly degraded areas. This research asserts that diversification of land use and types will increase the health and biodiversity of the Mackenzie Basin (Heller & Zavaleta, 2009). The balance between the conservation and production potential of each of the restoration types was analysed and presented in the previous chapter. In summary: 'Restore' was the only restoration type that had higher conservation value than production when considering 'production' as conventional agriculture, the production of commodity outputs. For 'Repair' and 'Reinvent', production scored higher. 'Repair' had the lowest conservation ranking but was second in production. This indicates that committing to full restoration or reinvention, results in higher conservation value than repairing to an intermediate point. This research suggests that this is possibly due to the use of models that are utilised for 'Repair' are scaled down versions of the 'Restore' elements. Or because they are trying to sacrifice the production to achieve restoration, but are not committing to full restoration, *or* fully integrating the conservation aspect like in the 'Reinvent' section. According to the concepts generated through this thesis: 'Restore' prioritises conservation over production (agriculture). 'Repair' is a compromise of both. 'Reinvent' represents the potentials afforded by integration. The 'Restore', 'Repair', 'Reinvent' values were associated with landscape conditions, a part of this research was examining the potential for removing the formulaic

approach to applying restoration in order to increase the multifunctional potential of the landscape. The key conclusions for this research on the role of the landscape condition and the relationship between intent or restoration type are presented below.

8.1.6 Question 3: Landscape condition

This section reflects on the effects of removing the landscape condition as the deciding factor for what can/should be done in a landscape, two observations are made. The first was that there are situations where the existing landscape condition will be ideal for the application of the concept and will assist in the positive change. Through the application of the groups to different landscape conditions, fragmented and variegated were frequently the condition that the concept would 'fit'. This indicated that there are situations in the Mackenzie Basin, where the desired action and intent aligns with the existing landscape condition.

The second observation was that there needs to be a balance between recognising this and utilising the existing, as long as it does not revert to a restricting/deciding factor. There is a risk that, identifying exiting areas will result in tunnel vision and be selected rather than analysing the landscape for the best arrangement of spaces and networks. Efforts are concentrated around the landscape conditions and arrangements that best achieve the intentions of the stakeholders and should not need be compromised in order to fit within existing conditions. However, the recognition and identification of these other areas can be integrated in other areas and goals. If the existing areas are located somewhere that does not align with one aspect of the land use change, it can be utilised for another. The balance between the best possible spatial arrangement, and optimisation of existing conditions needs to be reached.

As a part of the collaboration process identified by Duff et al. (2009), there needs to be collaboration and feedback throughout. Therefore, the following chapter identifies opportunities for further research.

8.2 Further Research

The fist component that allows for collaboration with other disciplines is that this research considered the roles of vegetation types, not the individual species. To confirm the species to be used would require further research, ideally involving collaboration between ecologists and the community who know the conditions of specific sites in detail. The only feature specified in this research is that the species were native (except where otherwise indicated), and eco-sourced to preserve the biodiversity of the region.

Other disciplines that could progress these concepts to collaboratively provide a resource and guidance for achieving the Mackenzie vision include the social sciences. A key aspect in the Mackenzie Basin is the pressure put on local councils and resources by the high proportion of transitional visitors. Therefore, the next step would be adding a layer of how those high numbers of people could assist ratepayers and council in the achievement of these concepts without additional pressure on local resources, becoming a positive variable, rather than a negative.

Additionally, in order to know the context for stakeholders to implement any management according to their landscape condition, a resource from DOC, LINZ or Ecan mapping the 'landscape condition' or 'structural integrity' would be appropriate. A map identifying the landscape condition is essential to guiding the locality of these concepts, alongside local knowledge. To an extent, the 'intact to fragmented' scale, relates to the existing landscape character classifications in the Mackenzie. For example – the areas of dairy share elements with the 'relic' condition, and the drylands production with the 'Fragmented'/ 'Variegated'. One question that arises is the impact that identifying landscape conditions would have on the residents through property values? This research would tentatively suggest that while previously the identification of biodiverse or intact land may have represented a restriction of potential production types, the possibilities presented through this thesis and the integration of different landscape conditions turn this restriction into opportunities for exploring new land uses.

To explore these new potentials, after the detailed context and species were defined, the relationship between research institutes such as Lincoln University, and existing stations, such as Guide Hill and Mount Grand stations, may be utilised for the testing of the concepts by applying them to a specific location to further test.

The wider placement/landscape scale implementation of the concepts presented through this research into the Mackenzie Basin can be guided by the layout presented by the previous projects mentioned on Page 17 (Previous projects on the Mackenzie) Alternatively, the Drylands Park concept could be presented alongside the concept as the potential for how the concepts contribute to the wider vision. Ideally, when this further research complete, the material could be compiled and presented to the community through the Mackenzie trust, and signatories. This would ideally contribute to the empowering of the community to achieve the vision identified in the Mackenzie Agreement.

As discussed in Finding the matrix (p. 62) The pressure on and from the tourism industry is significant (Hutchings & Logan, 2018). Due to the complexity of integrating these pressures, investigating the

potential of tourism elements and those identified in this research to compliment and achieve one another is an opportunity for additional research.

The purpose of this thesis initially was to investigate potential compelling multifunctional landscape visions for the Mackenzie Basin, as identified in the research question. From the beginning it was recognised that the Mackenzie is a complex and unique landscape. Enabling the expression of the landscape and systems, as well as the community who manage it, was a key part of the process. Through researching and informing the process in which to generate concepts for the community to utilise, two additional questions were asked. These questions were: What is the potential for levels and layers of conservation and production values through all landscapes? What are the opportunities afforded by removing the landscape condition as the deciding factor for an action? The answers to these have the potential to change the way that different aspects of the landscape are valued in New Zealand. This research presents the potential for a 'productive' landscape to be more than an exchange of commodity outputs for a degraded ecosystem. Instead, this research suggests that a 'productive' landscape would be a landscape that expresses and supports the values of those in the landscape without compromising the landscape systems that community and ecosystem relies on.

There were existing large-scale designs for the Mackenzie Basin, informed by the Mackenzie Agreement. The focus of this thesis was informed by the existing actions being taken in the Mackenzie Basin, alongside literature that expressed a need for actionable concept (Heller & Zavaleta, 2009; Lovell & Johnston, 2009a; Lovell & Johnston, 2009b). The focus was the generation of concepts that could empower the community to take actions on the land they were caretakers of and achieve the Mackenzie vision. These concepts were developed to the point of serving as a 'library of ideas' for the stakeholders to inspire actions. The starting point could be the point where an individual decided to take actions to progress the Mackenzie Agreements vision, or as a starting point for a cooperation between different groups of stakeholders.

The need for a starting point between different groups of stakeholders is due to the dichotomy of New Zealand landscapes between agricultural/cultural/modified landscapes and conservation landscapes. This dichotomy has partially been driven by, partially resulted in the perspective that land can be managed for either agricultural use or conservation. The stakeholders and community invested in the landscape have therefore been forced to pick a side of the hard line between these two land uses.

The analysis completed and presented in this research shows that there can be an integration of productive and conservation landscapes, especially if it is recognised that 'production' includes values with which there is not currently a dollar value associated. The integration of both landscape types is intended to increase the economic and social sustainability of both. The constant exposure of the community to natural systems is intended to increase understanding and investment. The integration of landscape systems through familiar landscapes is a blend of values, to protect and enhance the "unique and valuable landscapes" (Van Etteger et al., 2016, p. 80) of the Mackenzie Basin (DOC, 2016).

How the future of the Mackenzie Basin and vision transpires has impacts both nationally and worldwide. This thesis has investigated features which vary between those that are unique to the Mackenzie Basin, and those which are relevant nation and internationally. The concepts generated through this process represent the potential for reimagining the way we interact with the world through Landscape Architecture, but also by working collaboratively across disciplines. This collaboration needs to address landscapes and their issues in a way that to ensures they remain healthy for the sustainability of the planet, current community and future generations.

Significant developments have occurred in the Mackenzie during this the course of this research. These included an Environment Court decision on the intensification of Simons Pass Station (Holden & Littlewood, 2019), Te Manahuna Aoraki was established and announced an initiative for a huge 'predator free' area in the Mackenzie Region (Wright, 2018). The implications of these developments are that the future of the Mackenzie Basin is still evolving, and this research is relevant to how that future – and associated landscapes – transpire

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Appendix A

Conservation/production analysis of concepts according to restoration type

Restore					
Code	Goal	Legibility	Conservation	Production	Total(Out of 6 Stars)
1.1.1	Protect water quality	Implicit	***	*	****
1.1.2	Protect water quality	Explicit	***	**	******
2.1.1	Maintain Healthy vegetation cover	Implicit	***	*	****
2.1.2	Maintain Healthy vegetation cover	Explicit	**	**	****
3.1.1	Manage pests and weeds	Implicit	***	*	****
3.1.2	Manage pests and weeds	Explicit	**	*	***
4.1.1	Irrigated and Dryland Agriculture	Implicit	***	**	*****
4.1.2.	Irrigated and Dryland Agriculture	Explicit	***	**	*****
Total			22/24	12/24	34/48
Equivalent Stars and Percentage			2.75 Stars / 91.6%	1.5 / 50%	4.25/ 70.8%

Repair					
Code	Goal	Legibility	Conservation	Production	Total (Out of 6 Stars)
1.2.1	Protect water quality	Implicit	**	**	****
1.2.2	Protect water quality	Explicit	**	***	*****
2.2.1	Maintain Healthy vegetation cover	Implicit	*	***	****
2.2.2	Maintain Healthy vegetation cover	Explicit	**	**	****
3.2.1	Manage pests and weeds	Implicit	**	*	***
3.2.2	Manage pests and weeds	Explicit	**	*	***
4.2.1	Irrigated and Dryland Agriculture	Implicit	**	***	*****
4.2.2	Irrigated and Dryland Agriculture	Explicit	*	**	***
Total			14/24	17/24	31/48
Equivalent Stars and Percentage			1.74/ 58%	2.13/ 70.8%	3.87/64.5%

Reinvent					
Code	Goal	Legibility	Conservation	Production	Total(Out of 6 Stars)
1.3.1	Protect water quality	Implicit	**	**	****
1.3.2	Protect water quality	Explicit	**	**	****
2.3.1	Maintain Healthy vegetation cover	Implicit	***	***	******
2.3.2	Maintain Healthy vegetation cover	Explicit	**	***	*****
3.3.1	Manage pests and weeds	Implicit	**	*	***
3.3.2	Manage pests and weeds	Explicit	**	**	****
4.3.1	Irrigated and Dryland Agriculture	Implicit	**	***	*****
4.3.2	Irrigated and Dryland Agriculture	Explicit	*	***	****
Total			16/24	19/24	35/48
Equivalent Stars and Percentage			2/ 66.6%	2.37/ 79.2%	4.35/ 72.9%

Restoration type	Conservation	Production	Total
Restore	*********	*****	**********
Repair	******	*******	**********
Reinvent	*******	********	**********
Total	22/30	20/30	42/60
Equivalent Stars and Percentage	73.3%	66.6%	70%

Appendix B

Groups according to goals met

Group one: Layering up topography	
Goals	Level of relevance/achievement
Protect water quality	**
Maintain healthy vegetation cover	***
Manage pests and weeds	**
Mix of irrigated and dryland agriculture	***
Total:	10/12

Group two: Patches and connections	
Goals	Level of relevance/achievement
Protect water quality	*
Maintain healthy vegetation cover	***
Manage pests and weeds	**
Mix of irrigated and dryland agriculture	*
Total:	7/12

Group three: Cycling production	
Goals	Level of relevance/achievement
Protect water quality	**
Maintain healthy vegetation cover	**
Manage pests and weeds	**
Mix of irrigated and dryland agriculture	***
Total:	9/12

Group four: Staged revegetation	
Goals	Level of relevance/achievement
Protect water quality	*
Maintain healthy vegetation cover	**
Manage pests and weeds	**
Mix of irrigated and dryland agriculture	**
Total:	7/12

Group five: Layered riparian	
Goals	Level of relevance/achievement
Protect water quality	***
Maintain healthy vegetation cover	**
Manage pests and weeds	**
Mix of irrigated and dryland agriculture	*
Total:	8/12

Group six: Restoration/Pest management out from landmark	
Goals	Level of relevance/achievement
Protect water quality	**
Maintain healthy vegetation cover	**
Manage pests and weeds	***
Mix of irrigated and dryland agriculture	*

Total:	8/12

Combination of all groups	
Goals	Level of relevance/achievement
Protect water quality	**********
Maintain healthy vegetation cover	**********
Manage pests and weeds	**********
Mix of irrigated and dryland agriculture	**********

Appendix C

Concepts derived from 24 matrix combinations

Plate 1: Naturalistic riparian restoration

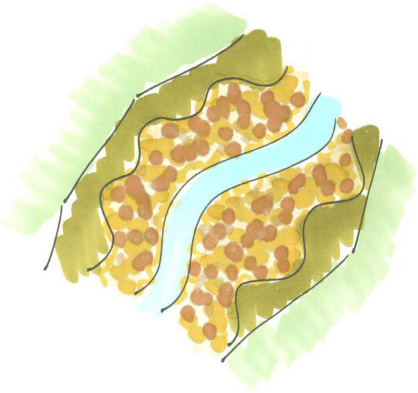
Goal 1: Protect water quality

Restoration type: Restore

Legibility type: Implicit

Summary 1.1.1

- Typical full naturalistic riparian restoration
- Use natural path of waterway to guide form
- Massed mixed planting – with gradual changes according to water levels
- Resembling vegetation species and arrange ment found in district.
- Fenced off from surrounding landscape if land use risks further degradation.



Concept 1.1.1 combines the Mackenzie goal of "protecting water quality" with "restore", therefore endeavoring to return the site to full functionality, implemented in a manner that is "implicit" in the communication of the people and processes in the site.

Plate 2: Linear riparian restoration

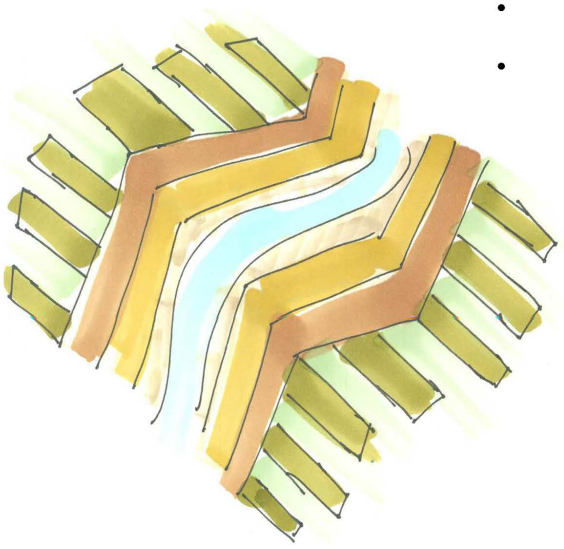
Goal 1: Protect water quality

Restoration type: Restore

Legibility type: Explicit

Summary 1.1.2

- Unnatural geometric form
- Expressing the path of the waterway but defin ing rather than disguising boundaries.
- Massed planting – with distinct visual changes according to water levels.
- Still utilizing vegetation species and layers f ound in district.
- Fenced off from surrounding landscape if land use risks further degradation.
- Perpendicular rows of vegetation to direct waterflows and stabilize surrounding ground.



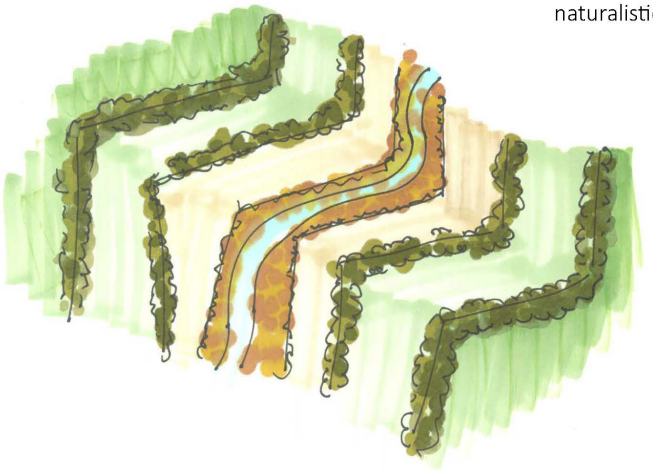
Concept 1.1.2 combines the Mackenzie goal of "protecting water quality" with "restore", as with 1.1.1, however this concept expresses the people and processes in the site in an "explicit" manner.

Plate 3: Naturalistic riparian protection

Goal 1: Protect water quality

Restoration type: Repair

Legibility type: Implicit



Summary 1.2.1.

- Enough riparian buffer to mitigate chemical runoff and stabilise banks.
- Buffer to follow form of stream buffer/path.
- Layered vegetation out from the initial riparian boundary.
- Decreasing intensity of land use close to waterway.
- Different layers of land uses associated with each layer out from the waterway
- Each layer out from water way separated by naturalistic native shelterbelt

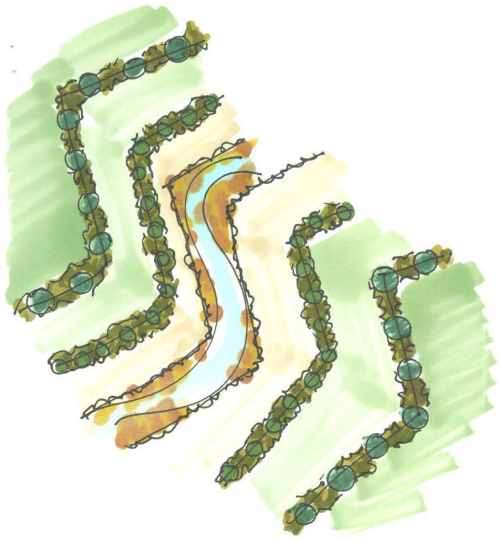
Concept 1.2.1 continues to focus on protecting water quality, combined with repairing the ecosystem, and making the processes implicitly legible.

Plate 4: Linear riparian protection

Goal 1: Protect water quality

Restoration type: Repair

Legibility type: Explicit



Summary 1.2.2.

- Enough riparian buffer to mitigate chemical runoff and stabilise banks.
- Buffer around stream path to be a sharp division, with straight lines.
- Layered vegetation out from the initial riparian boundary.
- Exotic specimen trees for production or
- shelter planted offset to allow windows through.
- Decreasing intensity of land use close to waterway.
- Different layers of land uses associated with each layer out from the waterway
- The difference in land use surrounding the river would be most obvious when crossing perpendicular to the waterway, as with each layer passed the land use changes, then be mirrored on the other side.

Concept 1.2.2 continues to focus on protecting water quality, combined with repairing the ecosystem, but changes the legibility to ensuring a structured appearance that represents human involvement and management.

Plate 5: Riparian landform battlements

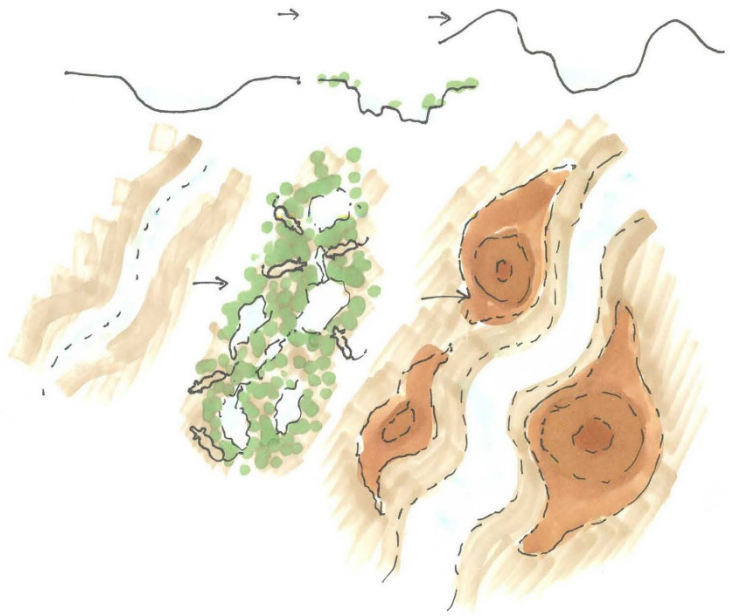
Goal 1: Protect water quality

Restoration type: Reinvent

Legibility type: Implicit

Summary 1.3.1

- Organic, but not strictly 'natural' forms
- Areas catering for more sensitive species on 'islands/patches/stepping stones'
- Buffer zones/layers around those areas
- Within a reformed waterway path & base revegetation (riparian buffer/corridor)
- The equivalent of terracing the side of a water way for different seasons
- Forms low enough and vegetated in natives so not to drastically change the character of the site, but visible enough to identify waterways in the landscape & that the form is not normal – make people question the source "natural or manmade?" of the design in a landscape already full of interesting contours.



Concept 1.3.1 is derived from the goal of protecting water quality, reinventing as the restoration technique, combined with implicit legibility.

Plate 6: Riparian terraced battlements

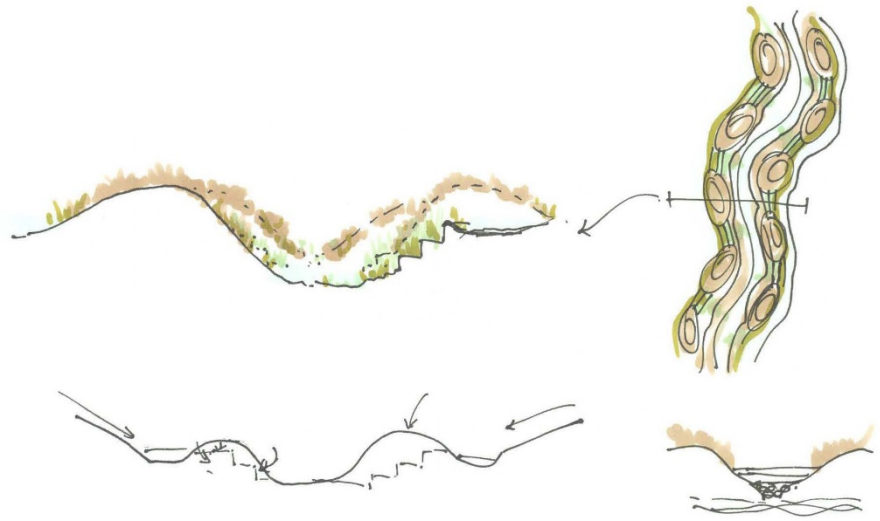
Goal 1: Protect water quality

Restoration type: Reinvent

Legibility type: Explicit

Summary 1.3.2.

- Appearance from the distance is smooth undulations – however, of regular size and spacing, in contrast to 1.3.1.
- From closer proximity the mounding can be seen interrupted by engineered terracing, with retention areas above them.
- Areas catering for more sensitive species on 'islands/patches/stepping stones'
- Higher intensity filtration than 1.3.2 due to settlement ponds before overflow terraces
- Retention areas create habitat for wading birds
- Forms low enough and vegetated in natives so not to drastically change the character of the site, but visible enough to identify waterways in the landscape, and regular enough to be identifiable as unnatural.



Concept 1.3.2 is the combination of the goal 'protecting water quality', the restoration technique reinvention, and explicit legibility.

Plate 7: Naturalistic revegetation

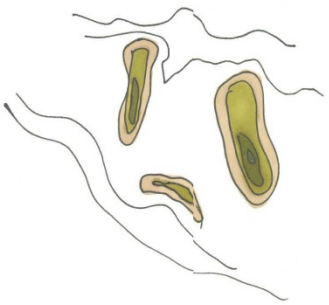
Goal 2: Maintain healthy vegetation cover on the land

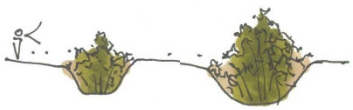
Restoration type: Restore

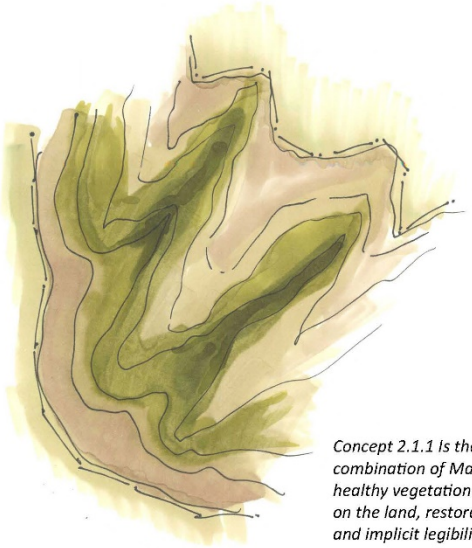
Legibility type: Implicit

Summary: 2.1.1.

- Using the landform to identify starting points for revegetation, such as undulations for shelter and moisture
- As well as utilizing the areas otherwise less valued (e.g. Slopes that machinery cannot access)
- Phased revegetation to allow shelter to establish for the more sensitive species
- Implicit legibility through the expression of landscape form in the planting location, and human involvement in the phasing.
- Softening the visual impact of the planting by using the low-lying areas for taller species/ starting point.







Concept 2.1.1 Is the combination of Maintain healthy vegetation cover on the land, restoration, and implicit legibility.

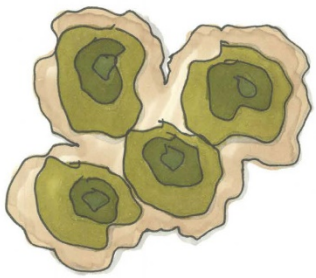


Plate 8: Successional forestry

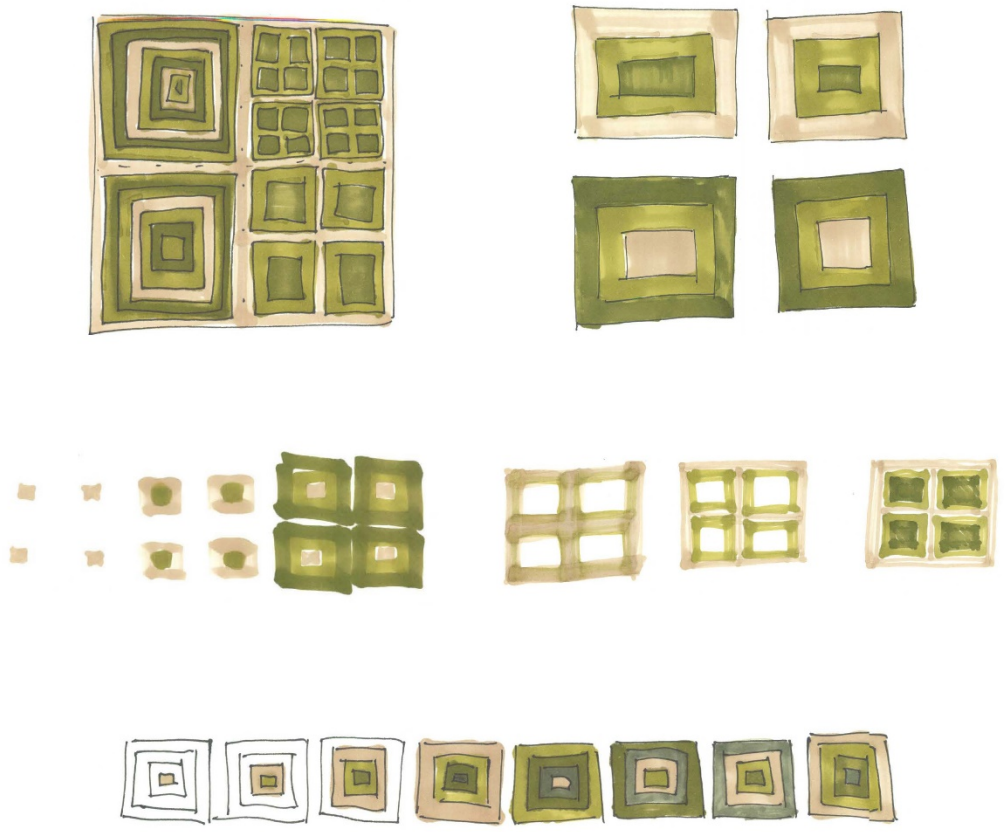
Goal 2: Maintain healthy vegetation cover on the land

Restoration type: Restore

Legibility type: Explicit

Summary:2.1.2.

- Implementing a geometric form convenient for different types of production machinery
- Setting up the similar layered/phased approach to restoration as above, however with the alternate purpose of using the same revegetation species for alternate production.
- Phased revegetation to allow shelter to establish for the more sensitive species
- Explicit legibility through the expression of production in the planting patterns, and human involvement expressing natural systems in the phasing.
- Creating cyclical systems of different production typologies



Concept 2.1.2 Is the combination of Maintain healthy vegetation cover on the land, restoration, and explicit legibility.

Plate 9: Lower intensity production

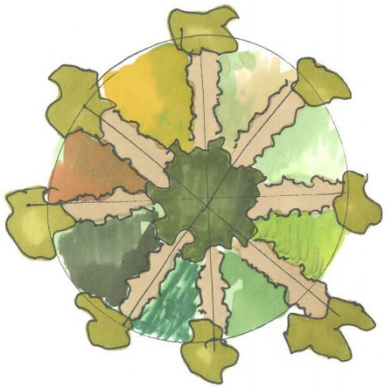
Goal 2: Maintain healthy vegetation cover on the land

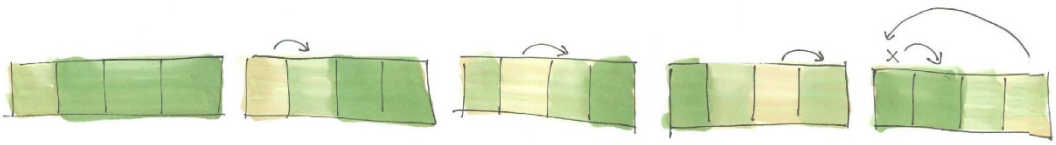
Restoration type: Repair

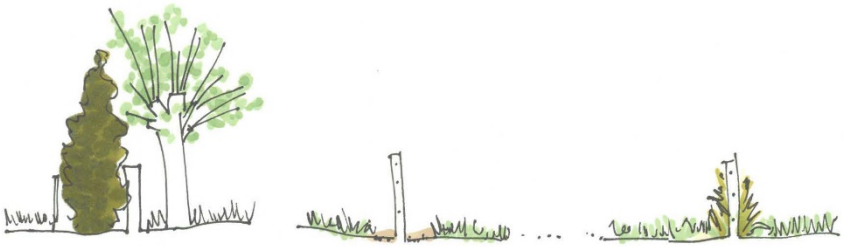
Legibility type: Implicit

Summary:2.2.1.

- Cyclical production
- Resting paddocks/blocks/areas for a season – growing green manure crop or just resting
- Networks of reserve areas/ corridors surrounding any intensive production areas
- Reserve areas able to be productive, with nitrogen fixing species and varieties suitable for coppicing for use as stock fodder and fertilizer.
- Leaving other areas such as verges and fence lines unsprayed for addition refuge.
- Implicit legibility in the framing of reserve areas & management for vegetation.







Concept 2.2.1 combines 'Maintaining healthy vegetation cover, with repairing the landscape, and making the processes implicitly legible.

Plate 10: Patches and marker trees

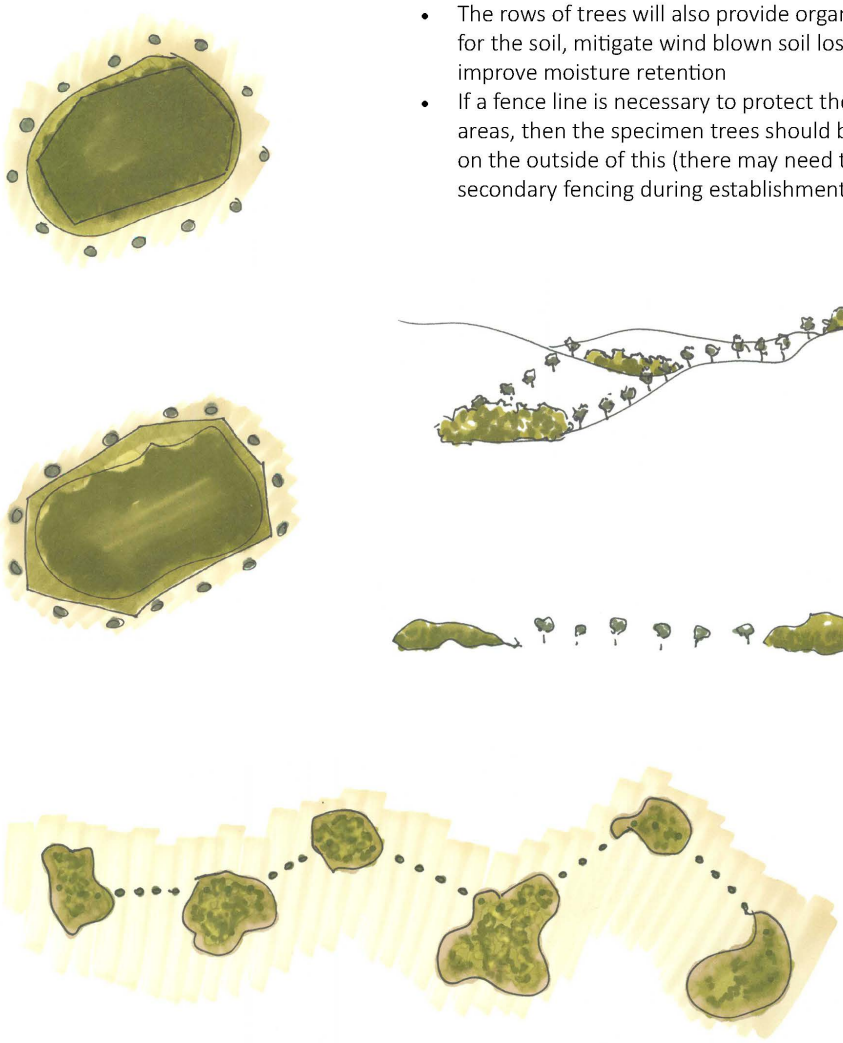
Goal 2: Maintain healthy vegetation cover on the land

Restoration type: Repair

Legibility type: Explicit

Summary: 2.2.2.

- Patches of land set aside and restored to the point of sustaining both permanent and transient populations of native species.
- Lines of specimen trees visually connecting the patches through the landscape
- Patches be (with consultation with doc) the minimum size to have an interior and edge layer, so to support greater diversity.
- Connecting trees to be of a non-invasive species, preferably with more than one benefit (nitrogen fixing, stock fodder or firewood)
- The rows of trees will also provide organic matter for the soil, mitigate wind blown soil loss, and improve moisture retention
- If a fence line is necessary to protect the reserve areas, then the specimen trees should be planted on the outside of this (there may need to be secondary fencing during establishment)



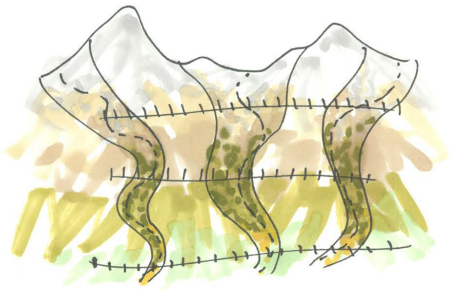
Concept 2.2.2 is the combination of goal 2: Maintain healthy vegetation cover, and restoration type 2: Repair, designed to be explicitly legible in the landscape.

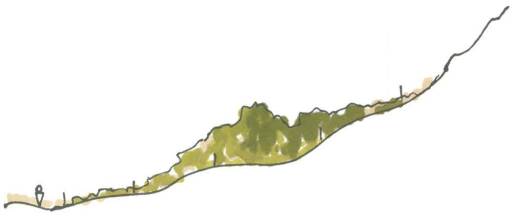
Plate 11: Zones for climate change resilience

Goal 2: Maintain healthy vegetation cover on the land

Restoration type: Reinvent

Legibility type: Implicit





Concept 2.3.1 is the goal 'Maintain healthy vegetation cover" combine with the restoration type reinvention, combined with implicit legibility.

Summary: 2.3.1.

- Allowing species movement up contours with climate change
- Ensuring the preservation of a wider range of habitat types
- Different types of production through the different topography
- Intersection of different land uses allowing for education and pest management
- The education surrounding pest management controlling the spread of weed species
- Management of vegetation types resulting in infrastructure (tracks and fences) that facilitate the management of pests, such as rabbits that degrade the vegetation cover.
- Potential for the higher altitudes to be split between public and private, of wholly public access for the management of Alpine herbivores (Thar/Chamois).
- If the tops were fully public, then there could be areas which were hunting blocks, and areas were animals were eradicated to control the spread of pests and maintain alpine vegetation.
- If the tops were split between farmer owned and public, there could be opportunities for farming of the game species.
- The percentage of land set for reserve at each elevation would be up for negotiation, and dependent on the areas of valuable diversity remaining, as it is understood that the lower topography is usually the easiest to cultivate.
- Ideally however, there would be the same amount of reserve distributed across all climate ranges.
- This is to allow the best preservation of a range of species and vegetation/habitat types.

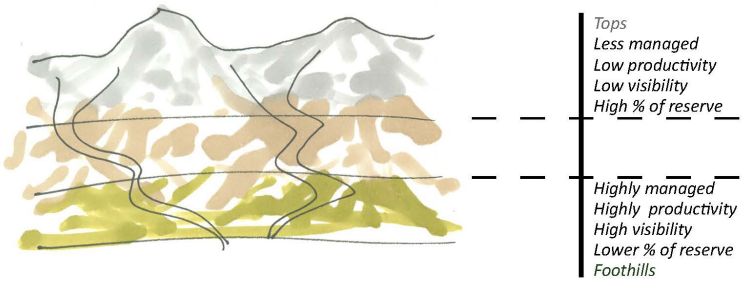


Plate 12: Naturalistic riparian restoration

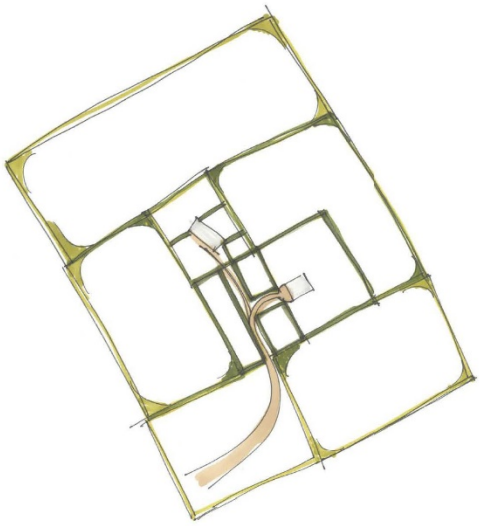
Goal 2: Maintain healthy vegetation cover on the land

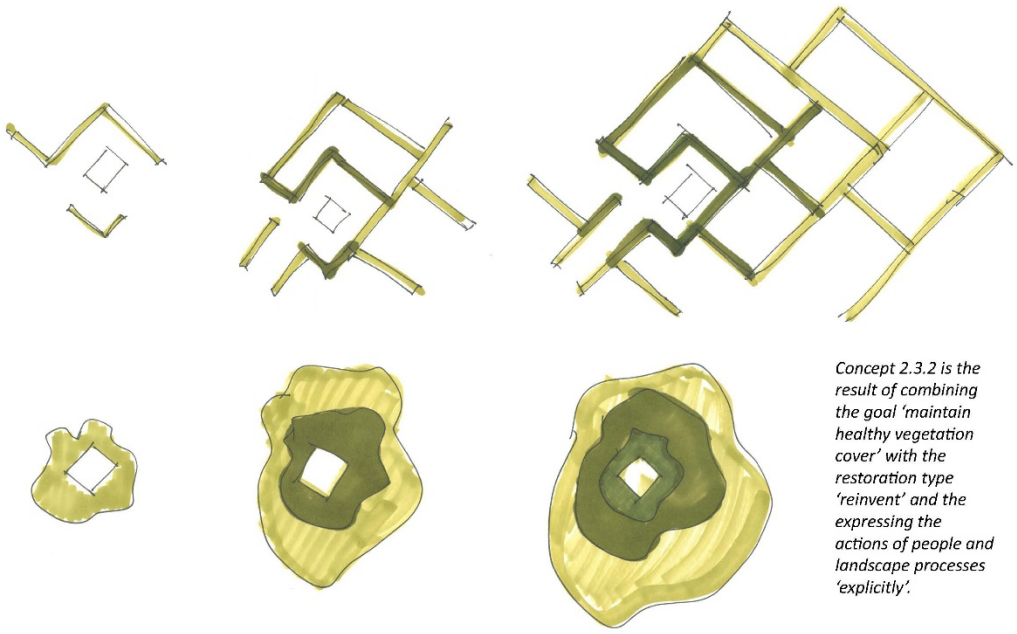
Restoration type: Reinvent

Legibility type: Explicit

Summary: 2.3.2.

- To increase shelter from wind and sun, increasing the amount of shelter vegetation
- Preferably using species that increase habitat and biodiversity
- Using the residence or farm center as a starting point, expanding out along fence lines and boundaries.
- Using the boundaries and fence lines like roots or the bloodstream. Expanding out from a point, down diverging paths, with the number of paths multiplying as it expands.
- Once the existing areas are established, start creating additional areas.
- Additional areas be aligned with the division of paddocks to encourage more managed grazing (in higher intensity areas), to prevent total stripping of the ground.
- Or additional areas to be the corners of paddocks that are missed when cutting hay due to lack of machinery access.
- Applying the staged revegetation, but rather than over a total area, through the boundaries and patterns that create a network based on the functions on a farm.
- Potential for it to be a condition of consent for new residences: Xm of planting need be completed in 5 years, XXm of planting be completed in 10 years, to Xm and Xm minimum distance from residences.





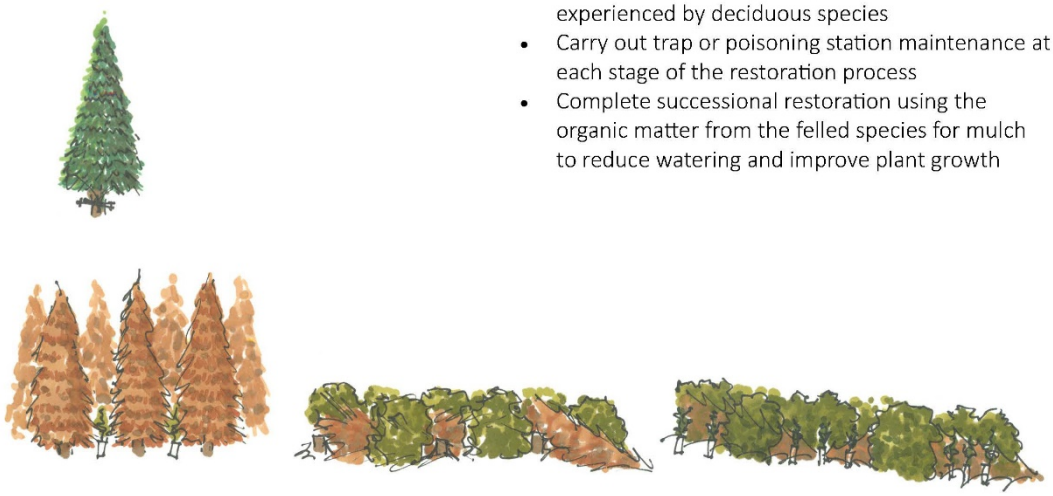
Concept 2.3.2 is the result of combining the goal 'maintain healthy vegetation cover' with the restoration type 'reinvent' and the expressing the actions of people and landscape processes 'explicitly'.

Plate 13: Invasive weeds as nurse crop

Goal 3: Manage animal pest and weed invasion

Restoration type: Restore

Legibility type: Implicit



Summary: 3.1.1.

- Use pest species (such as exotic conifers e.g. Pinus radiata in this concept) to provide a nurse crop or shelter
- Poison or ringbark pest species either while planting first stage of resilient natives, or before.
- Alternatively fell and use for mulch or firewood
- Fell remaining standing exotics
- Carry out poisoning or ringbarking in late summer so the fading colour is in sync with season change experienced by deciduous species
- Carry out trap or poisoning station maintenance at each stage of the restoration process
- Complete successional restoration using the organic matter from the felled species for mulch to reduce watering and improve plant growth

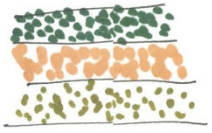
Concept 3.1.1 is the goal of managing animal pests and weed invasion, combines with the highest level of restoration, endeavoring to return the landscape to a form and function of full health. The application of these in the landscape was to be expressed in a implicit manner.

Plate 14: Restoration according to contours

Goal 3: Manage animal pest and weed invasion

Restoration type: Restore

Legibility type: Explicit



Summary: 3.1.2.

- Same staged restoration as 3.1.1
- Using the contours to dictate each stage of the restoration/management process
- At each interval implement a pest proof fence, protecting the improving ecosystem from further degradation.
- Horizontal separation of different stages to separate focus areas

Concept 3.1.2. is the same combination of weed and pest control with restoration but differs in the way these are expressed in the landscape. Concepts 3.1.2 is designed to be explicit in the way actions and processes can be read through landscape patterns.

Plate 15: Viral restoration

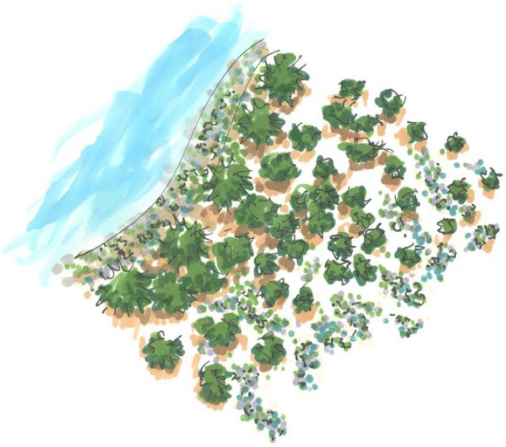
Goal 3: Manage animal pest and weed invasion

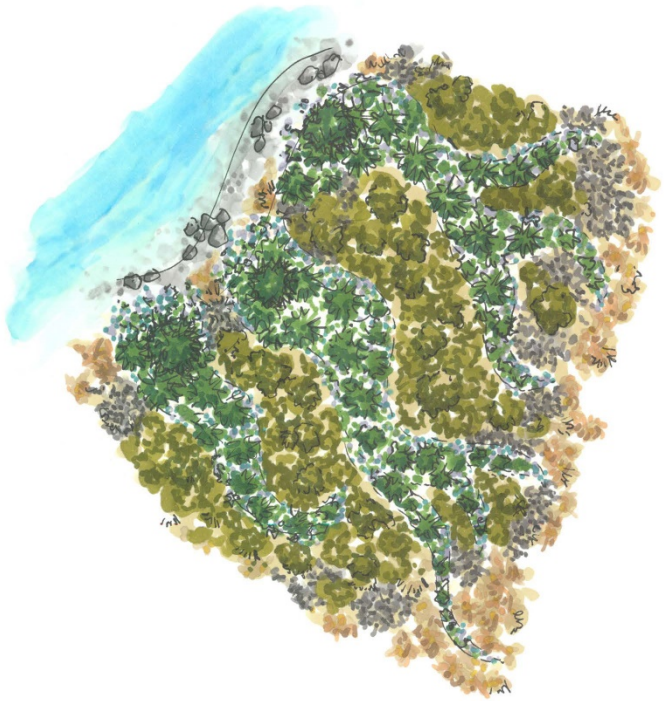
Restoration type: Repair

Legibility type: Implicit

Summary: 3.2.1.

- Using the patterns of the weed and pest species in the landscape to contrast the areas being managed and those that are not.
- Human managed forms to express the viral spread of those species
- Juxtaposing the repaired areas and the areas that are not, to show the difference that the management of those species makes in the landscape.
- Using familiar and organic forms that are visible in the landscape for their contrast rather their from
- The separation also stands to clarify the species that are exotic or weed species, reducing the risk of misunderstanding and accidental or intentional spread of detrimental species.





Concept 3.2.1 is the combination of Managing animal pests and weed invasion, with repair, the second level of restoration. The systems and patterns of achieving this are then expressed implicitly in the landscape.

Plate 16: Grid restoration

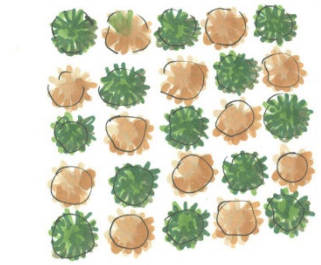
Goal 3: Manage animal pest and weed invasion

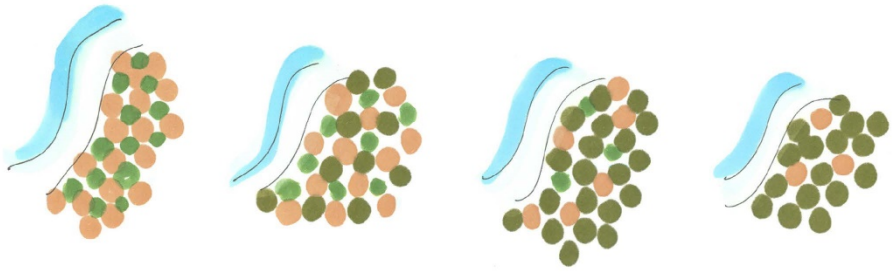
Restoration type: Repair

Legibility type: Explicit

Summary: 3.2.2.

- The poisoning of pines in a grid pattern
- Applying the following stages of restoration in the same grid pattern, with gradually more and more removed/ filled in.
- As this is the 'Repair' level of restoration, complete eradication is not an objective, only improving the health of the ecosystem.
- The secondary objective is the systems being 'Explicitly' legible. So, this legibility combined with the above, some weed species could be left standing to maintain the explicit nature of the scheme.





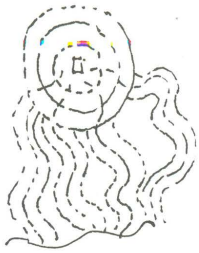
Concept 3.2.2 is the combination of the goal 'Manage animal pests and weed invasion', the restoration technique 'Repair' and the legibility technique 'Explicit'

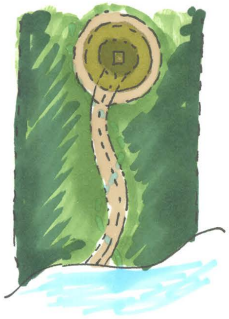
Plate 17: Node to destination restoration

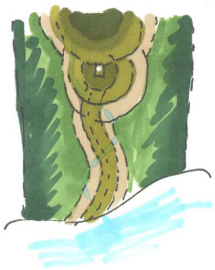
Goal 3: Manage animal pest and weed invasion

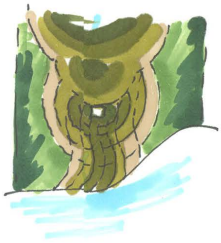
Restoration type: Reinvent

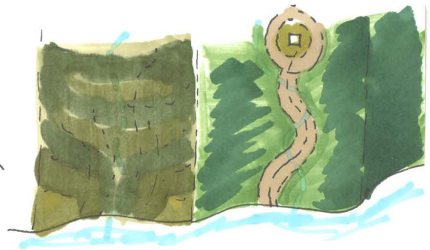
Legibility type: Implicit











Summary: 3.3.1.

- The location of a facility/amenity away from a corresponding attraction/destination. In this case, a campsite and the lakeside. It could be a house and a road, or a store of stock feed and the main farm track or the destination paddock/block.
- The 1st step is creating a connection. In this concept it is a pedestrian track through the area struggling with a pest and weed problem.
- The land around this connection receives no special attention, so that as they travel too and from the destination any change is experienced perpendicular to the restoration.
- This is achieved through radial restoration (in the methods of 3.1.1, and 2.1.). The base/starting point of the restoration moves further down the track as the starting point restoration has the last stage of vegetation planted.
- For example, the campground could have minimal permanent fixtures and move each stage.
- If each stage of restoration is completed yearly, that still means any set up would be in place for multiple years (three in this concept). This is a feasible time for things like a picnic area/campsite, or a store of stock feed. It is less feasible for a structure like a residence.
- If the starting point remains the destination, there will be a wave effect when moving down the access route, passing through the different levels of restoration, and then different ages of vegetation.
- After the first block is completed, the process moves along the destination, to implement a new starting point.

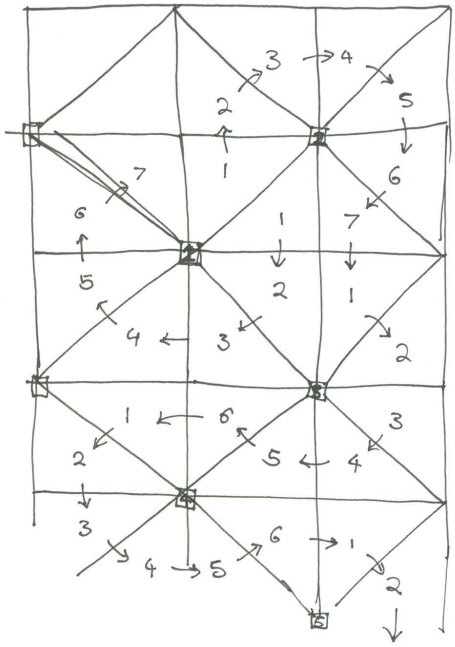
Throughout the concepts for this goal, benefits that could be derived from the pest and weed were considered. Therefore, the next two concepts are less about the specifics of what happens to each species, and more about reinventing how the management is applied.
The first concept, 3.3.1, is the combination of the 'Manage animal pests and weed invasion', and 'reinvent' expressed in an implicit manner.

Plate 18: Segmented restoration

Goal 3: Manage animal pest and weed invasion

Restoration type: Reinvent

Legibility type: Explicit



Summary: 3.3.2.

- Larger scale scheme than 3.3.1
- Requires the division of land into these blocks a long time prior to the restoration reaching them.
- Phased restoration that is applied around centers in a systematic manner that moves the center once the entire surrounding is restored.
- Could be used to guide 3.3.1, but the forms would require modification.
- Allows the center to be semi- permanent.
- Would use the 3.1.1. restoration technique within the segments
- Bears some resemblance to the patterns left by pivot irrigators.

Concept 3.3.2 is the combination of the goal 'Manage animal pests and weed invasion', the restoration level 'Reinvent' and explicit legibility.

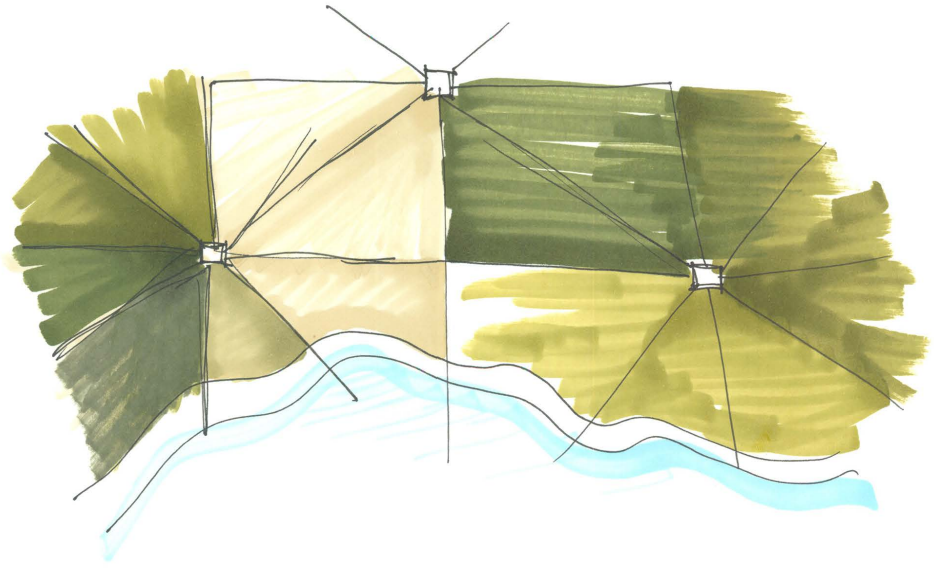


Plate 19: Irrigated restoration contours

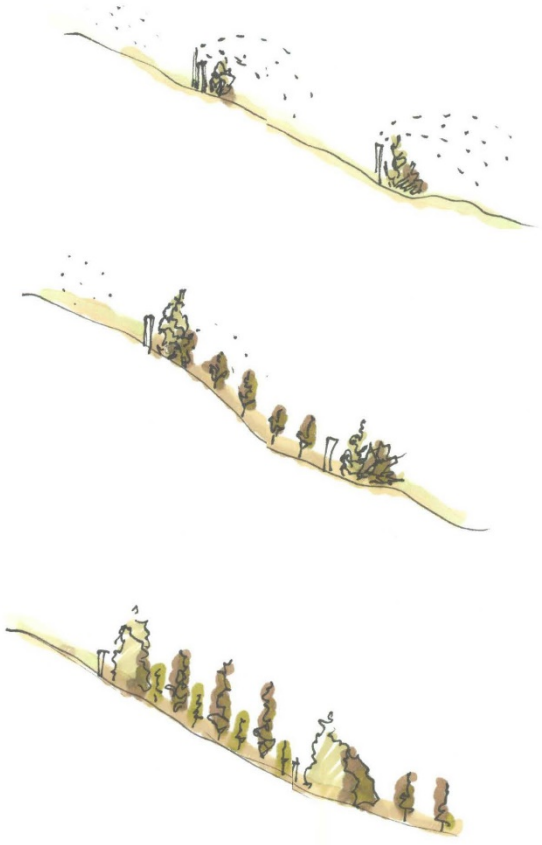
Goal 4: Irrigated and Dryland Agriculture

Restoration type: Restore

Legibility type: Implicit

Summary 4.1.1.

- Creating layers in the landscape either using contours or other measurements.
- Utilizing water to irrigate these divisions.
- Also using the water to establish native shelter for filtration.
- The native shelter provides water filtration of the irrigation, they also provide the first stage of restoration.
- The restoration is completed in stages, with the second layer of planting completed within once division, before the 1st stage of planting is completed in the next division.
- The irrigation will be used to ensure greater success in the planting establishment, and theoretically, the more stages of planting completed, the less irrigation necessary.



Concept 4.1.1 is the combination of the goal 'irrigated and dryland agriculture' with restoration, and implicit legibility.

Plate 20: Dryland restoration contours

Goal 4: Irrigated and Dryland Agriculture

Restoration type: Restore

Legibility type: Explicit

Concept 4.1.2 the combination of the goal 'irrigated and dryland agriculture' and restoration, with explicit legibility.

Summary 4.1.2.

- Can be the 'next step' after 4.3.2 however, is also applicable without it
- Without the use of 4.3.2, areas are cleared to create rows of briar or whatever scrub is on site.
- Restoration is then stepped out along these divisions.
- Within each section there would be a gradient of species, ranging from forest/scrub, to the herb species found between tussock.
- This results in a repetitive pattern up the contours.
- This concept would be most explicit the point where the entire area has been planted, but natural succession has not yet begun.

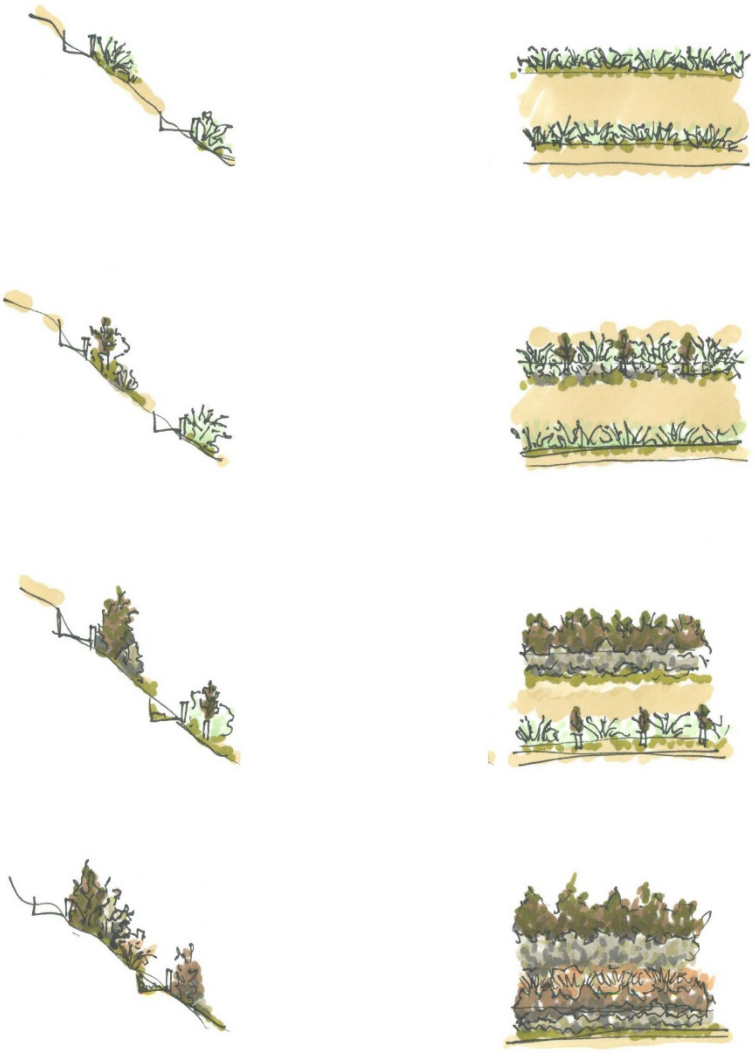


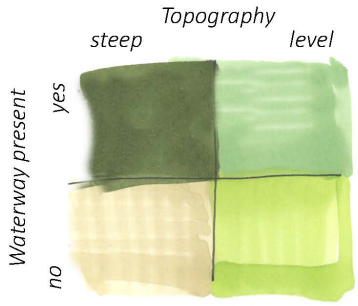
Plate 21: Waterway/topography matrix for land different land uses

Goal 4: Irrigated and Dryland Agriculture

Restoration type: Repair

Legibility type: Implicit

Concept 4.2.1 is the combination Irrigated and dryland agriculture which achieves 'repair' level restoration and is implicitly legible.



Summary 4.2.1.

- Uses vegetation and land use change to emphasise landscape systems and different land uses.
- Two different variables resulting in four main land uses. The combination of a topography type (steep or level), and proximity to a waterway (yes or no) resulted in:

Waterway + Steep topography = Revegetation
Waterway + Level topography = Exotic tree species
No waterway + Level topography = Irrigated agriculture
No waterway + Steep topography = Dryland agriculture

- Features that overrule these combinations are: always having riparian planting on waterways, and the relative sustainability of irrigation at certain distances from waterways.

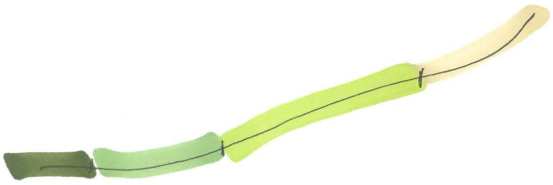


Plate 22: Water driven landscape appearance

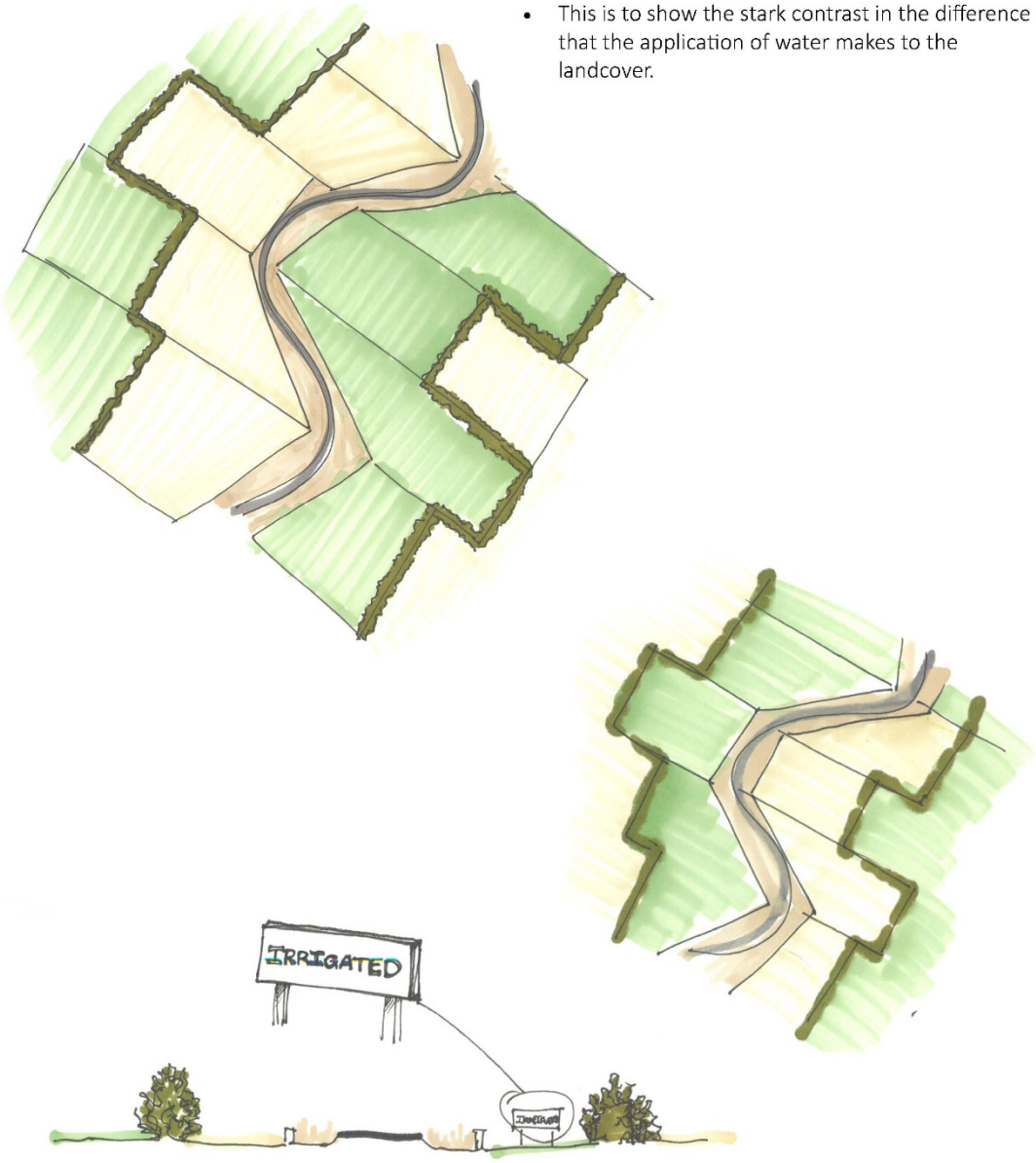
Goal 4: Irrigated and Dryland Agriculture

Restoration type: Repair

Legibility type: Explicit

Summary 4.2.2.

- On either side of a state highway or main thoroughfare, there is one side which water is applied (irrigated) and one that it is not.
- The side which is irrigated changes yearly, after it has been grazed.
- The side that is being irrigated is literally signposted.
- This is to show the stark contrast in the difference that the application of water makes to the landcover.



Concept 4.2.2 is the combination of the irrigated and dryland agriculture goal, and repair restoration as above, however explicitly legible.

Plate 23: Water 3 ways- Restoration, Irrigation , Habitat

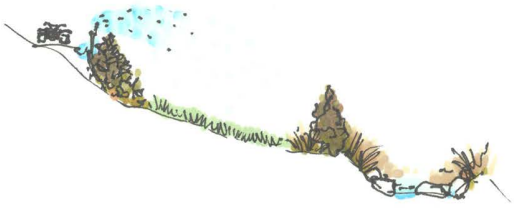
Goal 4: Irrigated and Dryland Agriculture

Restoration type: Reinvent

Legibility type: Implicit

Summary 4.3.1.

- Using irrigation to establish rows of vegetation in close proximity to the source of the water
- Emphasising the landform using the vegetation, also screening the lower slopes, so the visually different areas of irrigated pasture are not the main focus
- Using the layers of vegetation as filters for any runoff from pastures.
- Having alternate production in the source of the water for the irrigation. In this case: a water race and pools appropriate for freshwater crayfish farming.
- Implementing the vegetation at the same time across the site, so the succession of species is consistent



Concept 4.3.1 in the result of the goal 'Irrigated and dryland agriculture' with the last restoration level 'reinvent', and implicit legibility.

Plate 24: Contours for rosehips and shelter

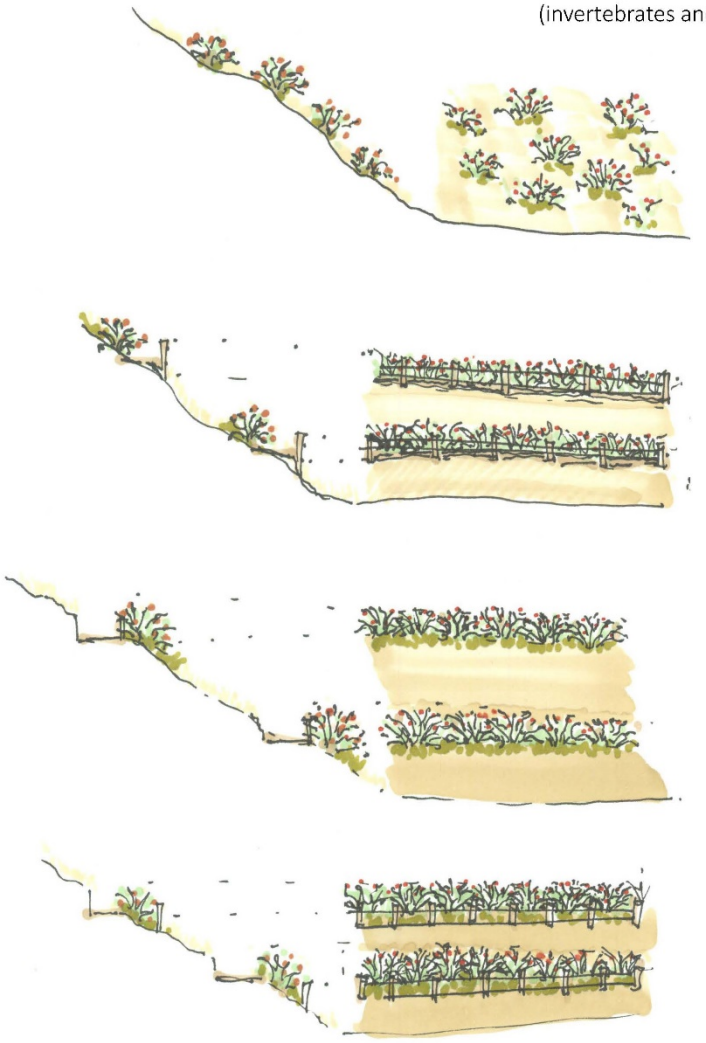
Goal 4: Irrigated and Dryland Agriculture

Restoration type: Reinvent

Legibility type: Explicit

Summary 4.3.2.

- The slopes where briar roses are prevalent are shaped to from rows for the harvesting of the rose hips
- Where this is not possible, alternate species are utilized.
- The images below explore different configurations of the relationship between the tracks needed to harvest the rosehip, the fence required to manage stock, and the topography.
- Alternate stock was considered, diversifying from sheep or beef, ideally any waste from the rosehips, could be fed back into the system, either as fertilizer or feed for whatever stock variety.
- Under the rows of rosehips, native species are encouraged, to provide habitat for smaller species (invertebrates and reptiles)



Concept 4.3.2 is the same combination of 'Irrigated and dryland agriculture' with 'reinvent' but is designed to be explicitly legible.

Appendix D

Modified Landscapes

Material removed due to copyright compliance

Appendix E

Reserve, conservation and freehold land

Material removed due to copyright compliance

Appendix F

Mackenzie signatories

Material removed due to copyright compliance

(UWSVF, 2013a, p. 1)

Appendix G

The Mackenzie Basin area

Material removed due to copyright compliance

(UWSVF, 2013a, p. 3)

Appendix H

Six Groups of Concepts

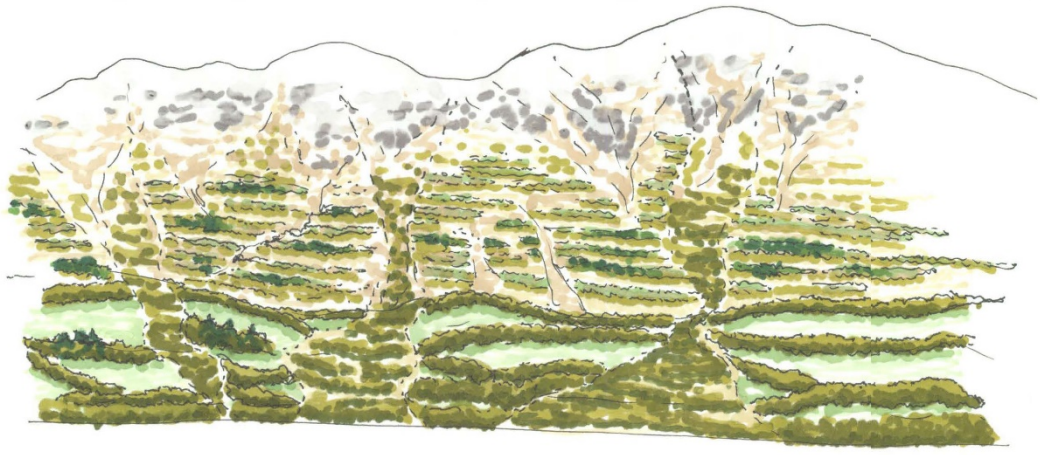
Group one: Layering up topography

Concepts: 2.3.1, 4.2.1, 4.3.1, 4.3.2, 3.1.2, 4.1.1, 4.1.2

Goals addressed: 'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion', and 'Irrigated and dryland agriculture'

Summary: Concepts 2.3.1 and 3.1.2 were the first and second step respectively. 2.3.1 was used to demarcate the areas that were for restoration and for production. In this case 'restoration' and 'production' are not used in an exclusive or binary sense, but to indicate the dominant driver of that area. Concept 3.1.2 is an overlay of the general progression of pest management up the topography. The third 'overall' concept is 4.2.1 which uses topography and proximity to a waterway to guide the vegetation type and land use. 4.2.1 could have been applied alongside the other 'production' concepts, but equally, the production concepts can be adapted and placed according to 4.2.1. Therefore, it was decided to apply it overall in order to more effectively protect the relationship between the productive areas and any waterways. By placing a concept that informs the location of land uses first, the productive land uses are limited in their locations. By managing the locations of production in relation to landscape systems, the impact of production is reduced purely by locating them in an informed and sympathetic manner. The riparian buffers, biodiversity, water filtration and alternative production methods are additional positive impacts of the concept.

Landscape type	Stages of Process						
	Stage one	Stage two	Stage three	Stage four	Stage five	Stage six	Stage seven
Intact	Designate areas	Pest removal	Start production	Manage pests and weeds			
Variegated	Designate areas	Pest removal	Provide revegetation across degraded areas	Start production	Manage pests and weeds		
Fragmented	Designate areas	Pest removal	Create connections between the remaining patches	Restore/ revegetate across degraded areas	Start production	Manage pests and weeds	
Relic	Designate areas	Pest removal	Repair remaining patches	Create connections	Restore/ revegetate across degraded areas	Start production	Manage pests and weeds



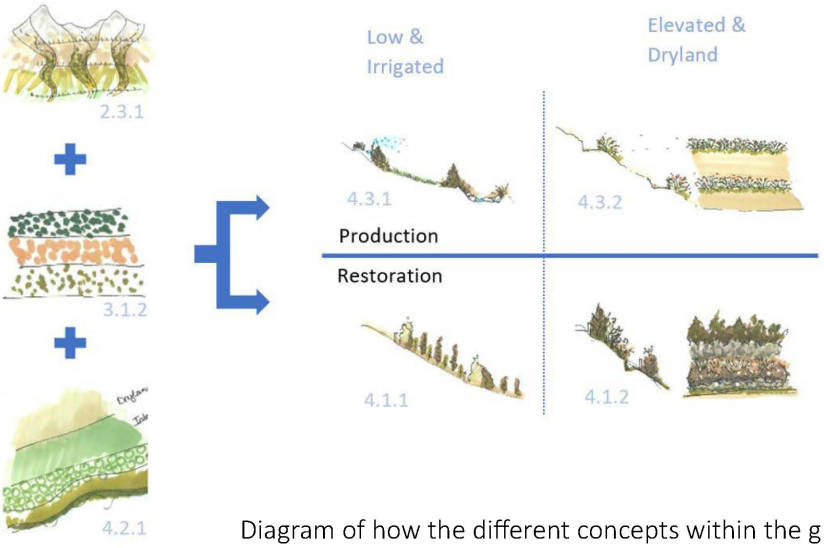
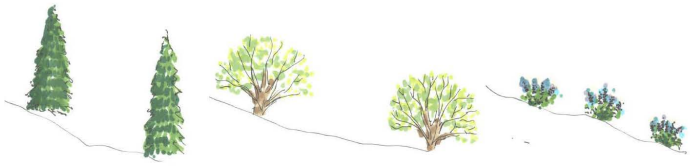
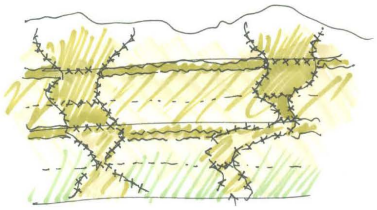


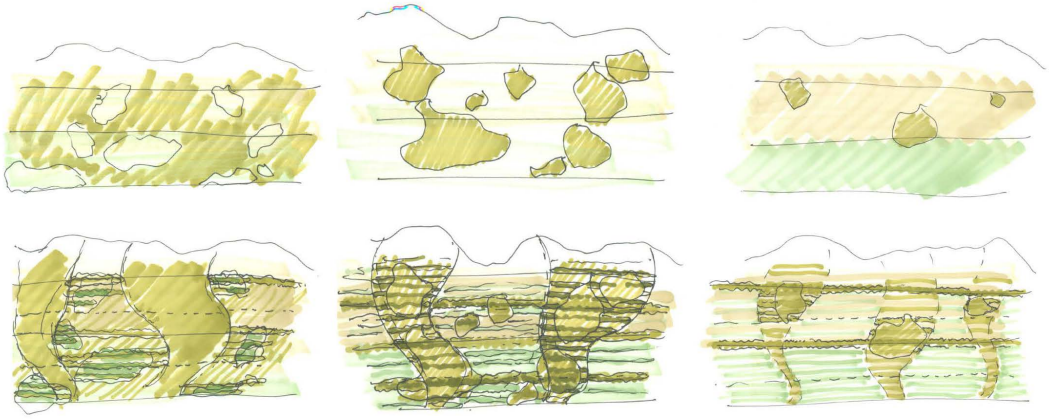
Diagram of how the different concepts within the group interact



Other exotics such as conifers, willows, or lupins could be used in place of the briar roses used in the concepts for goal four



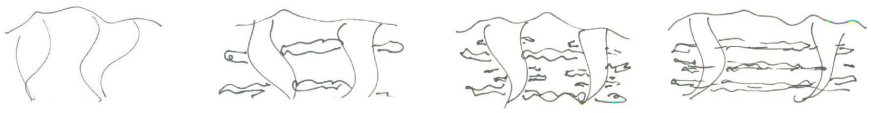
Landscape condition: Intact



Landscape condition: Variegated

Landscape condition: Fragmented

Landscape condition: Relic



1. Identify corridors

2. Add connections

3. Plant out from reserves + gaps

4. Fence off layers

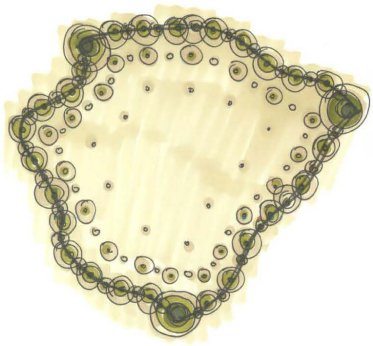
Group 2: Patches and Connections

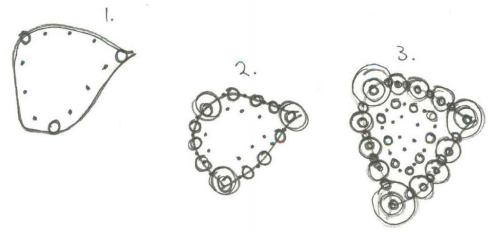
Concepts: 2.2.2

Goals addressed: Maintain Healthy vegetation cover

Summary:
The themes present in this group focus on improving connectivity between areas of restoration and improving the health of the associated patches. The steps taken to achieve the concepts in this group link strongly to group three – staged revegetation.

Landscape type	Stages of Process				
	Stage one	Stage two	Stage three	Stage four	Stage five
Intact	Secure buffer	Pest removal			
Variegated	Increase connectivity	Secure buffer	Pest removal		
Fragmented	Create intermediate patches	Increase connectivity	Secure buffer	Pest removal	
Relic	Create interior in relics	Create intermediate patches	Increase connectivity	Secure buffer	Pest removal



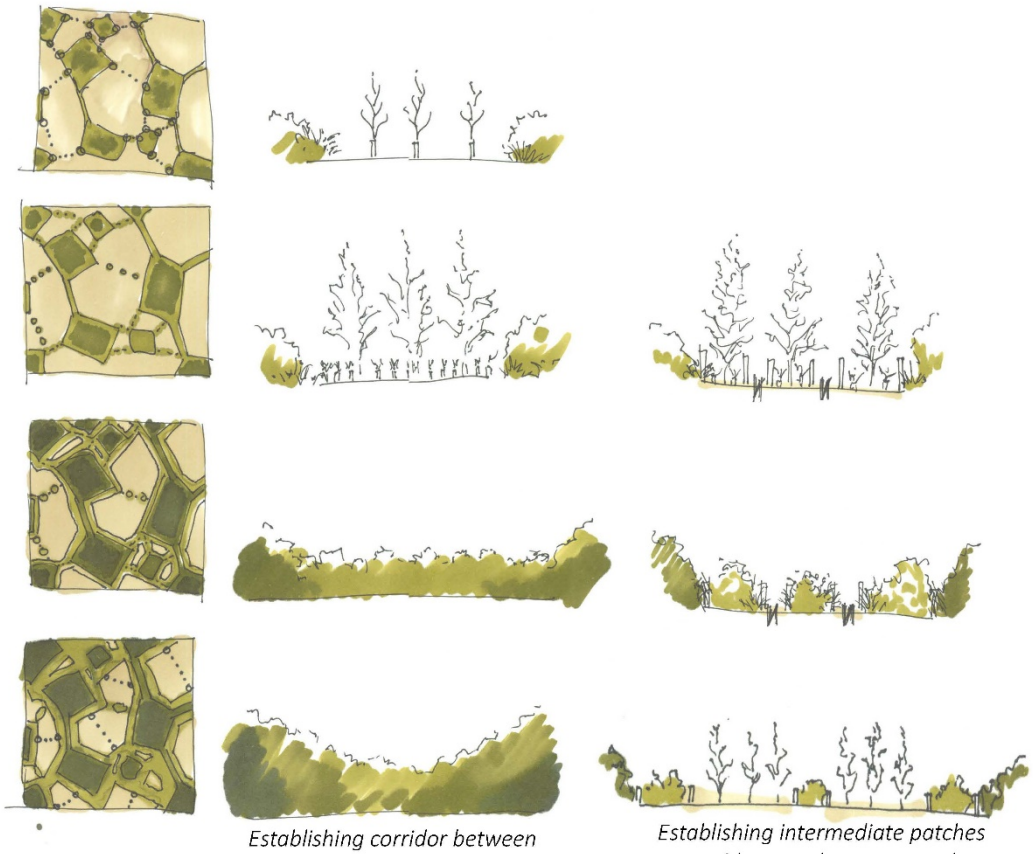


The application of this group to an intact landscape uses the structure of 'patch and connection' to structure a pest and weed management program that progresses through the intact landscape

Landscape condition: Intact

Landscape condition: Variegated

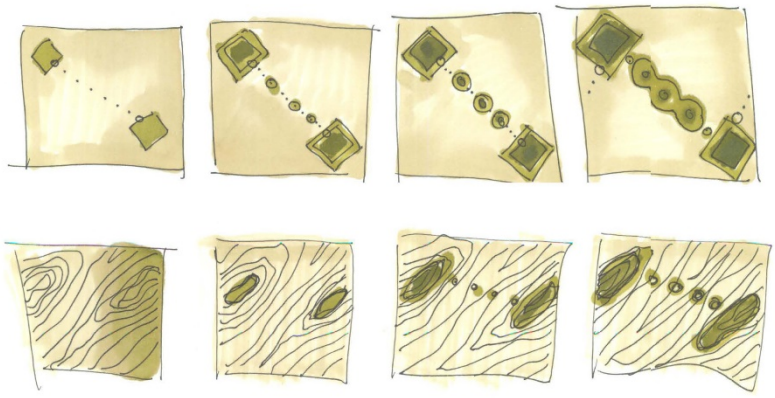
Group 2: Patches and Connections



Establishing corridor between patches

Establishing intermediate patches over wider gaps between patches

Landscape condition: Fragmented



Establishing patches and connections in level relic landscape

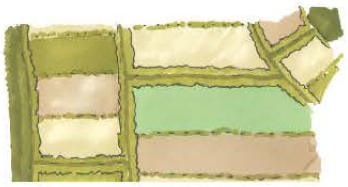
Establishing patches and connections in undulating relic landscape (using low locations)

Landscape condition: Relic

Group 3: Cycling production

Concepts: 2.1.2, 2.2.1, 3.1.1, 4.2.2.

Goals addressed: *'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion', and 'Irrigated and dryland agriculture'*

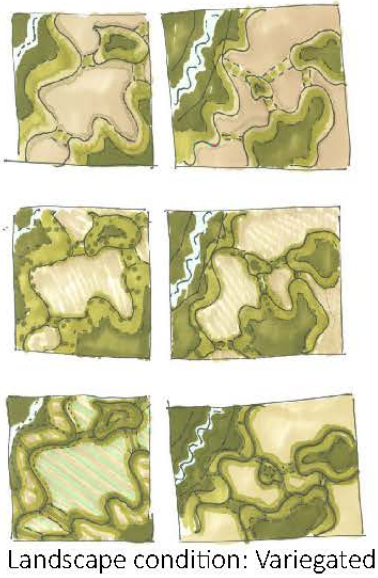


Summary:
Starts with the border between the modified and unmodified area. Staged revegetation planting is carried out. This occurs in different ways at different distances from the border. There are two 'layers' in both the existing unmodified habitat, and the existing modified habitat. There is an interior and an edge layer in the unmodified habitat. In the modified area there is a 'buffer' area of production and there is the higher intensity area, which represents the start of the modified landscape surrounding the unmodified area.
The movement of disturbance (stock or crop harvest) moves parallel to the edge. The divisions/steps of this disturbance are perpendicular to the layers resulting in a grid. The progression of staged revegetation moves along this grid, following the progression of disturbance.

Landscape type	Stages of Process					
	Stage one	Stage two	Stage three	Stage four	Stage five	Stage six
Intact	See group four					
Variegated	Secure edge & riparian corridor	Connect patches	Convert buffer to new system	Expand shelter through production		
Fragmented	Secure edge & riparian corridor	Connect patches	Convert buffer to new system	Expand shelter through production		
Relic	Secure edge & riparian corridor	Connect patches	Convert 'buffer' to edge	Expand shelter through production	Convert buffer to new system	Expand shelter through production

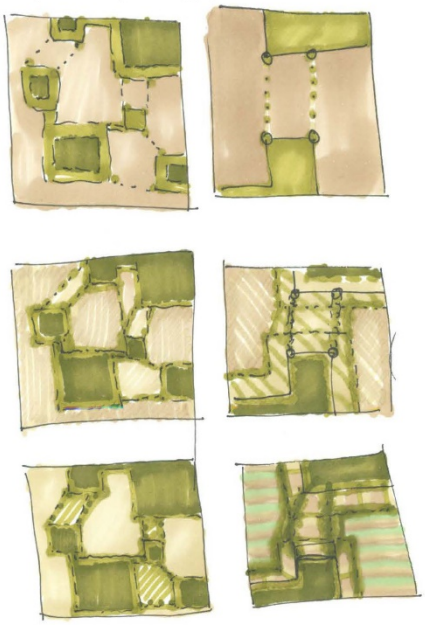
Key	Patch	Buffer	Production
Interior	High		
Edge	Low	High	
Passable/corridor		Medium	High
Inhospitable		Low	Medium
Impassable			Low

Relative permeability within the different typologies

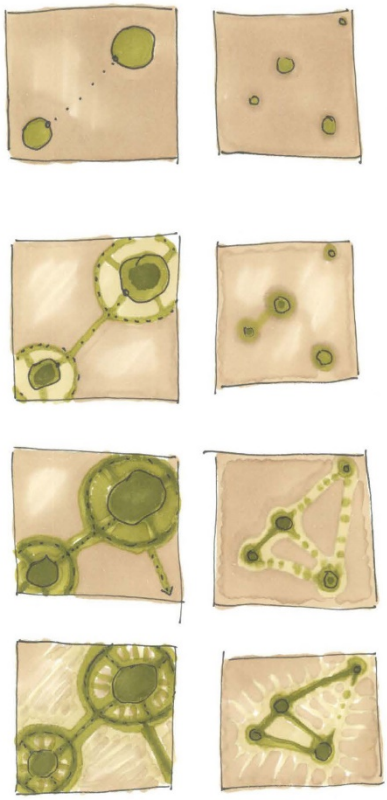


Landscape condition: Variegated

Group 3: Cycling production

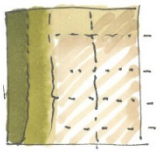


Landscape condition: Fragmented

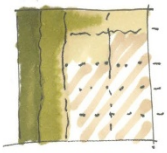


Landscape condition: Relic

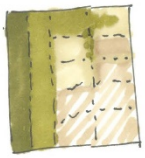
1. Establish buffer around patch
Identify and fence off future corridor



2. Begin revegetation through corridor
Reduce production intensity out from proposed corridor



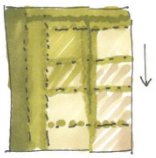
3. Begin revegetation intermediate shelter/corridor
Continue production intensity out from proposed corridor



4. Continue revegetation intermediate shelter/corridor
Continue production intensity out from proposed corridor

5. Continue revegetation intermediate shelter/corridor
Continue reducing production intensity out from proposed corridor

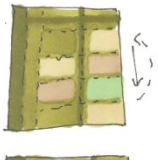
6. Continue revegetation
Reduce production intensity on second layer
Sustainable harvest in buffer nearing maturity



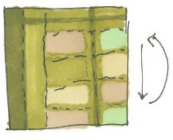
7. Harvest area of buffer zone
Cycle production through second layer

7. Continue cycle
Allowing buffer zone to recover and second zone to have a variety of permeability

7. Continue cycle in perpetuity, increasing permeability for native species, whilst integrating production

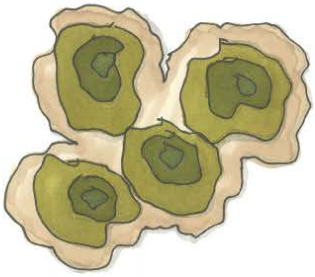


System for expanding out from patch
(using colour codes identified on previous page)



Group 4: Staged revegetation

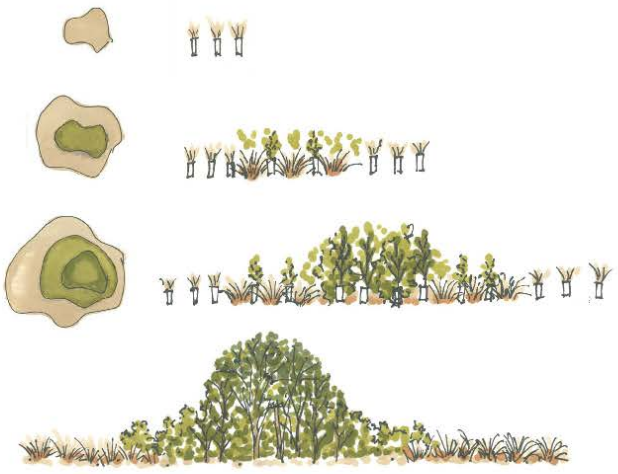
Concepts: 2.1.1, 2.3.2, 3.1.1, and 3.3.2
Goals addressed: *'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion'.*



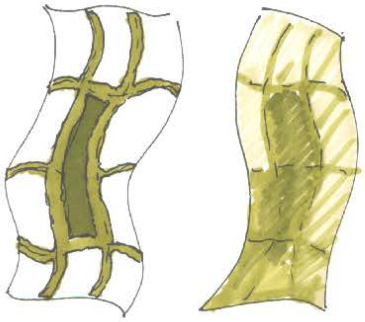
Summary:
This group can be interpreted at two scales. The first is the scale presented by concept 2.1.1, which stages the succession of revegetation. Emulating natural succession but managing the area to achieve best planting success. This technique is also presented in group 2, for achieving connections in a fragmented landscape by utilizing shelter species and pioneer species. The second is at the landscape scale, where areas of the landscape are managed first improve health, then to provide some form of production. Beyond this, it is suggested that through careful management, a harvesting or alternative production system could be implemented. Suggestions include sustainable/successional forestry, or the harvesting of oils or fiber from native species.

Landscape type	Stages of Process				
	Stage one	Stage two	Stage three	Stage four	Stage five
Intact	Pest free/self-sustaining	Harvestable/ sustainable use			
Variegated	Existing areas are self-sustaining, and beginning to spread	Pest free/self-sustaining	Harvestable/ sustainable use		
Fragmented	Improving existing areas	Restored areas are self-sustaining, and beginning to spread	Pest free/self-sustaining	Harvestable/ sustainable use	
Relic	Creating connections and new areas	Improving existing areas	Restored areas are self-sustaining	Pest free/self-sustaining	Harvestable/ sustainable use

Green line on chart- typical 'finish' point of a restoration project
Brown line on chart- proposed finishing point for new system



Scale 1: Successional revegetation



Although this is largely a system rather than spatial concept, the above diagrams show some potential arrangements of a system of harvest/restoration that maintains connectivity.

Scale 2: System + Production

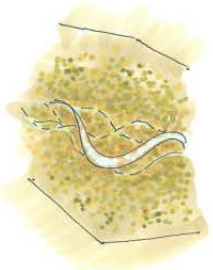
Group 5: Layered riparian

Concepts: 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.1, 1.3.2.

Goals addressed: *'Protect water quality'*

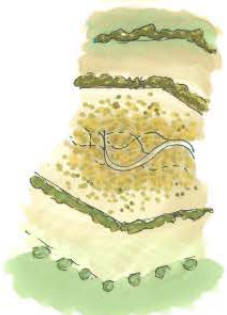
Summary:
Identify and protect waterway/riparian corridor
Fence off to prevent physical degredation form stock and to delineate landscape system
Being restoration within corridor
Uses phases of planting for legibility of human involvement
Layer land uses back from corridor according to their impact/ intensity

Landscape type	Stages of Process					
	Stage one	Stage two	Stage three	Stage four	Stage five	Stage six
Intact	Fence off & manage pests	Implement layers of buffer				
Variegated	Identify high risk areas & fence off	Remove existing pests	Begin restoration in where required	Finish restoration & buffer	Manage pests	
Fragmented	Identify natural path in degraded areas	Remove pests not being used for shelter	Redefine path, begin restoration	Begin restoration where required	Finish restoration & buffer	Manage pests
Relic	Identify natural path. Fence off	Remove pests not being used for shelter	Redefine path, begin restoration	Begin restoration	Finish restoration. Establish buffer	Manage pests



Identify remnant corridor *Carry out pest management* *Banks secured/ reformed* *Staged revegetation carried out* *Buffer zones established* *Pest management continues. Potential for NCO production*

Landscape condition: Variegated and Fragmented



Fence off to prevent and layer land uses back.

Landscape condition: Intact

Fence off to prevent physical degredation and layer land uses back.

Identify and remove pests. Revegetate as per 1.1.1

Landscape condition: Relic

Group 6: Restoration out from landmark

Concepts: 3.2.1, 3.2.2, 3.3.1

Goals addressed: *'Maintain healthy vegetation cover', 'Manage animal pests and weed invasion'.*

Summary:
Landmark for this concept consists of linear feature that indicated a starting point for an area.
A possible 'landmark': Lake water line, stream, hill crest, paddock edge, property boundary, bush line.
The clearing of the pest species (stage three on the chart) marks the point where that area becomes under the jurisdiction of group four: staged revegetation.

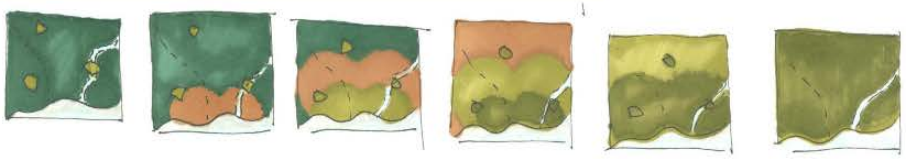
Landscape type	Stages of Process			
	Stage one	Stage two	Stage three	Stage four
Intact	Identify intervals	Begin management	Ensure total area clear	See group 2 – Patches & connections – Intact
Variegated	Identify intervals	Begin management	First area: pests eradicated	See group four – Staged revegetation
Fragmented	Identify intervals	Begin management	First area: pests eradicated	See group four – Staged revegetation
Relic	Identify intervals	Begin management	First area: pests eradicated	See group four – Staged revegetation

Poison trees and/or fell *Begin revegetation* *Revegetation complete*

The 'pest' species used as an example is exotic conifers. Due to the visual contrast provided, and highly invasive nature

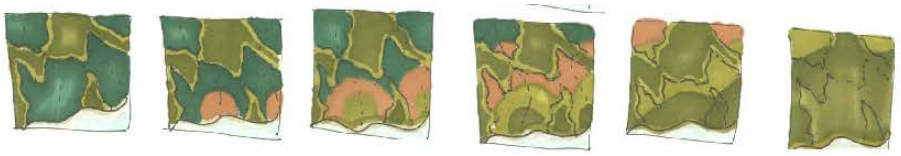
Landscape condition: Intact

Landscape condition: Variegated



As fragmented and relic landscapes are higher proportion of modified than unmodified landscape, the pattern which restoration is carried out changes from the main system. The progression parallel to the landmark continues, but within that area, the distance from the access path dictates each stage

Landscape condition: Fragmented



Landscape condition: Relic